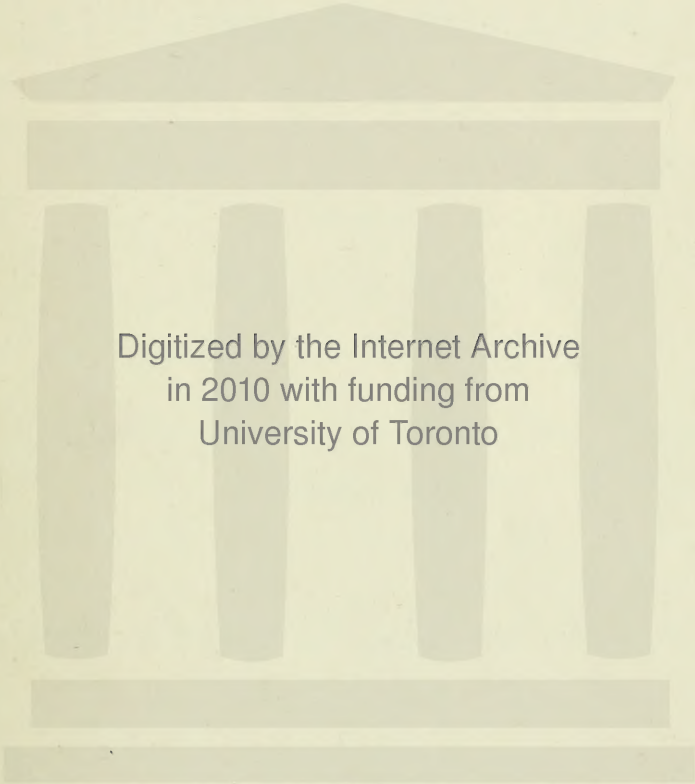
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THE OTTAWA NATURALIST.

THE

TRANSACTIONS

OF THE

OTTAWA FIELD-NATURALISTS' CLUB.

VOL. III.

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Young, James.

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Edwards, Henry, 185 East 116th Street, New York, U.S.
Hill, Albert J., *C.E.*, Moody, B.C.
Merriam, Dr. C. Hart, Locust Grove, N.Y., U.S.
Ormerod, Miss E. A., Dunster Lodge, near Isleworth, England.
Provancher, Abbé, Cap Rouge, Que.
Saunders, Prof. Wm., *F.R.S.C.*, *F.L.S.*, London, Ont.
Smith, John B., National Museum, Washington, U.S.

CONSTITUTION.

1. *Name and Object.*—This Club shall be called the Ottawa Field-Naturalists' Club, and its object shall be the study of the Natural History of this locality.

2. *Officers.*—The Officers of the Club shall consist of a President, first and second Vice-Presidents, a Secretary, a Treasurer, and a Librarian, who, together with three other members of the Club, shall form a Council, all of whom shall be elected annually, and shall be eligible for re-election, and who shall have the management of all the business of the Club. In the event of any vacancy occurring in the Council during the year the same may be filled by the election of a successor at any of its regular meetings.

3. *Auditors.*—There shall also be two Auditors elected annually to examine the Treasurer's accounts for the following year and report thereon at the next annual meeting.

4. *President and Vice-Presidents.*—The President shall direct all the business of the Club, and preside at all meetings of the Club and

Council; his duties, in the event of his absence, devolving on the Vice-Presidents in their order.

5.—*Secretary.*—The Secretary shall give previous notice to each member of the Club of every meeting of the Club, and to each member of the Council of every meeting of the Council; shall make and keep a true record of the proceedings of all meetings of the Club and of the Council, have custody of the Constitution, By-laws and Records of the Club, and conduct its general correspondence.

6. *Treasurer.*—The Treasurer shall be charged with the collection and custody of the funds of the Club, and keep a regular account thereof, which shall always be open to the inspection of the Council. He shall also submit at each annual meeting a statement showing the financial condition of the Club.

7. *Librarian.*—The Librarian shall have charge of all publications of the Club and shall distribute the same under the direction of the Council. He shall also have the custody of all books and papers belonging to the Club, and shall supervise their circulation among the members.

8. *Council.*—The Council shall, as business may require, meet from time to time at the call of the President, or of any two officers; shall control all matters affecting the welfare of the Club, subject to this Constitution; shall have full control of the funds of the Club, and shall report its proceedings to the members at the Annual Meeting.

9. *Annual Meeting.*—The Annual Meeting of the Club shall be held on the third Tuesday in March, at which, in addition to other business, the Annual Report of the Council shall be read, and the Council and Auditors for the following year elected, by ballot after nomination, by a majority of the members present.

10. *Special Meetings.*—A Special General Meeting of the Club may be called by the Council; and shall be called on requisition of not less than ten members, specifying the business they wish brought before the meeting. The Council shall call the meeting within fourteen days from the receipt of the requisition, giving one week's notice. No other business shall be transacted than that mentioned in the notice.

11. *Conduct of Meetings.*—The presence of ten members shall be required to constitute any general meeting of the Club, and of three members to constitute a meeting of the Council. All meetings shall be conducted under such by-laws and rules of procedure as may from time to time be adopted.

12. *Proceedings.*—Excursions in Summer, and evening meetings and classes of instruction in Winter, shall be held, and the Transactions of the Club shall be periodically published; all arrangements for which shall be made by the Council.

13. *Members.*—Any lady or gentleman desiring to join the Club shall send a written application, signed by the applicant and endorsed by the recommendation of two members, to the Secretary, and if approved shall be elected at the next meeting of the Council. Members desiring to leave the Club must previously settle all dues and signify their intention in writing to the Secretary.

14. *Corresponding Members.*—The Council shall have the power of electing Corresponding Members, who shall be persons not residing in Ottawa or its immediate vicinity, but who may be desirous of promoting the objects of the Club. Corresponding members shall not be required to pay membership fees.

15. *Annual Fee.*—The annual membership fee shall be one dollar, payable in advance, due on the third Tuesday in March, and no member in arrears shall be entitled to any of the privileges of the Club. New members to pay the fee for the current year upon election. The payment of the annual fee to entitle a member to receive a copy of the Transactions, as published, and to admission to the Club Soirees without further charge.

16. *Amendments.*—This Constitution may not be changed or amended except by a special meeting of the Club called for that purpose, and by a two-third vote of the members present.

EDITORIAL ANNOUNCEMENT.

THE OTTAWA NATURALIST is issued by the Ottawa Field-Naturalists' Club in continuation of its Transactions already published; the second volume of which was completed by the number for 1885-1886. For eight years the Club has earnestly carried on the work for which it was organized—"The study of the Natural History of this locality." Nor has it confined itself to this rich and extensive field. It has gradually extended its influence, and, by excursions, classes and lectures, has sought to foster a love for Natural History, and a desire in all its members to investigate the marvellous realms of nature.

After careful consideration of suggested changes in the method of carrying on the Club's work, it has been decided that its value, not only to members but to scientific observers in other places, will be greatly increased by the issue of a portion of its Transactions each month. This will ensure an earlier publication of the papers prepared for its soirees, which is especially desirable when new species are described, and will keep the members more fully informed as to the progress of its work. The record of its proceedings will be made as complete as possible. To the papers and reports that have formerly appeared, will be added an account of each general meeting, soiree, class, excursion, sub-excursion, or other undertaking of the Club. This step will double the present size of our Transactions, and will necessarily entail a proportionate outlay. We must therefore have many new members. The Council will do all in its power, but the required increase in membership can only be secured by the active co-operation of every member of the Club. Especially will ladies be welcomed to our ranks, and every effort will be put forth to make the excursions and soirees pleasant as well as instructive It is much regretted that up to the present time the lady members have, with a few exceptions, not taken an active part in the work of the Club. There are several branches of natural history, such as Botany, Entomology and Ornithology, which offer to them attractive fields for observation and experiment, and in which many ladies are doing most excellent work elsewhere.

The Club has endeavoured to impress the value of an acquaintance with the works of nature upon the teachers in our educational institu-

tion of all kinds, and upon those now being trained for these important positions. Every teacher would derive immeasurable delight and profit from such a knowledge, and those whose duties are performed outside the larger cities have great advantages in their closer proximity to inexhaustible and almost unexplored mines of scientific wealth. Teachers would do well to avail themselves of every opportunity of acquiring a knowledge of natural history so as to be able to communicate information whenever requested.

The time has come to renew our investigations in the field—to watch the return of the birds, the unfolding of leaf and flower, the reappearance of insects, the emerging of reptiles and other animals from their winter retirement. Notes of all these, and of similar occurrences should be carefully taken, and forwarded to the leaders who have been appointed in each branch to preserve and compile such records. It is particularly requested that the leaders of the Ornithological branch be kept informed as to the arrival and movements of our birds. These are now working northward to their breeding grounds and summer habitats; some to remain with us, others stopping merely to rest and feed before continuing their journey.

The Club has been requested by the American Ornithologists' Union to co-operate with it in obtaining information as to the migrations and breeding habits of all birds resident in or visiting this district, and to exert its influence in increasing the number of observers. The schedules and instructions furnished for making the desired records may be obtained on application to the United States Department of Agriculture, or through the Secretary of this Club.

It should be mentioned that this number of our magazine is necessarily filled with the reports of proceedings and other routine matter, and that the papers read before the Club during the past winter will be commenced in the next issue. Notice will then be given, by the leaders, of the sub-excursions to be held during the season, and of the first excursion if it has been arranged. Members can materially assist the Club by purchasing copies of the magazine, or of any monthly part thereof, to send to friends, or to persons interested in natural history pursuits.

ANNUAL MEETING.

The ninth annual meeting of the Club was held on Tuesday, 15th March, 1887, in the Museum of the Ottawa Literary and Scientific Society, commencing at 4.30 p. m. The President, Prof. Macoun, occupied the chair, and the following members were present, including all the council:—R. B. Whyte, Prof. Woods, James Fletcher, T. J. MacLaughlin, F. R. Latchford, W. H. Harrington, Dr. Small, Rev. Prof. Marsan, W. P. Anderson, H. M. Ami, Dr. Baptie, E. B. Bell, Fred. Magee, R. Broadbent, J. Ballantyne, J. M. Macoun, John Stewart, W. R. Billings, Mrs. Reid, R. W. Ells, E. R. Faribault, R. Chalmers, R. G. McConnell, W. McInnes, A. E. Barlow.

After the minutes had been read the Secretary presented the Annual Report of the Council, which is printed in this number, and which was adopted upon motion of Mr. Ballantyne and Mr. Anderson, after some discussion as to the proposed plan of issuing the Transactions in monthly parts, in which the following members also joined:—Dr. Small, Prof. Woods, Prof. Macoun, Mr. Fletcher and the Secretary. The Treasurer's statement (also printed in this number) showing that all expenses had been fully defrayed, including some payments for the previous year, was adopted on motion of Mr. Billings and Dr. Baptie. The Librarian reported that many valuable exchanges and donations had been received by him during the year, and that an additional book-case was required for their reception. On motion of Mr. Fletcher and Mr. R. B. Whyte the Council was instructed to make such provision as might be found necessary for their preservation. There being no further business to transact, Prof. Macoun announced that the election of officers would be held, and that, as retiring President, he desired to state that the out-going Council had been very attentive to their duties, and had each endeavoured to do all in his power to advance the interests of the Club. Mr. Broadbent and Mr. J. M. Macoun were appointed scrutineers, and the election proceeded, resulting in the choice of the following Council:—President, R. B. Whyte; 1st Vice-President, Prof. Macoun; 2nd Vice-President, Prof. Woods; Secretary, W. H. Harrington; Treasurer, J. Fletcher; Librarian, T. J. MacLaughlin; Committee, Dr. Small, H. M. Ami, Dr. Baptie. A vote of thanks, moved by Mr. Anderson and Mr. Bell, was passed to the retiring officers, and the meeting adjourned at six p.m.

ANNUAL REPORT OF THE COUNCIL.

OFFICERS—1886-1857.

PRESIDENT.—Prof. John Macoun.
VICE-PRESIDENTS.—1st, R. B. Whyte; 2nd, Prof. S. Woods.
SECRETARY.—W. H. Harrington.
TREASURER.—T. J. MacLaughlin.
LIBRARIAN.—F. R. Latchford.
COMMITTEE.—Dr. Small, James Fletcher, Rev. Prof. Marsan.

To the Members of the Ottawa Field-Naturalists' Club:—

The Council has great pleasure in reporting that the condition of the Club is at present very satisfactory; that its work has been prosecuted with earnestness, and that valuable scientific discoveries have been made in every branch of Natural History to which attention has been given.

The number of new members added during the year was only fifteen, but it was more than sufficient to counter-balance the losses occasioned by removal of members from the city, resignations or other causes. The membership stands at the encouraging figure of 170.

Miss E. A. Ormerod, Entomologist to the Royal Agricultural Society, of England, has been elected a corresponding member of the Club. Her publications on economic entomology are known wherever an interest is taken in such subjects, and have gained for her a deservedly high reputation. This makes the number of Corresponding Members eight, but one of these we shall shortly be able to welcome to active membership, as Prof. Saunders comes to Ottawa to take charge of the Experimental Farm, established by the Dominion Government. His labours in connection with fruit growing, entomology, and kindred subjects are known to all of you, and the Club may confidently look forward to receiving material assistance from him in carrying on its investigations, while other benefits will undoubtedly arise from the establishment of the Experimental Farm in this neighbourhood.

Several pleasant and profitable excursions were held during the summer, and were well attended. The first was to King's Mountain on the 18th May, and although the morning was very unfavourable there were enough present to fill two vans, and the trip turned out quite a success. The second was to Buckingham on 3rd June, when, in addition to the usual proceedings, a visit was made to the phosphate mills, and the process of preparing this mineral for consumption was

examined. The third was to Eastman's Springs on 24th July, when some interesting collections were made in the Mer Bleue swamp, and surrounding neighbourhood, and the waters of the mineral springs duly examined and tested. The fourth was to Meech's Lake on 4th September, on which occasion Mrs. W. J. Tilley very kindly invited all those present to visit her cottage, beautifully situated at the head of the lake, where she hospitably entertained them.

Sub-excursions were held almost every Saturday afternoon, from the opening of spring until late in the autumn, and those who attended did not fail to be both interested and instructed in the various branches, especially in Geology, Botany and Entomology.

The Botanical class, conducted by Mr. R. B. Whyte, in the Central School West, was, upon the appearance of vegetation, practically instructed in the field, the lessons being continued into the month of June. Many children had thus an excellent opportunity of acquiring a first insight into some of the beauties and interesting problems of plant life.

A very agreeable conversazione was given, on the evening of the 26th May, to the Fellows of the Royal Society, under the joint management of the Councils of the Club and of the Ottawa Literary and Scientific Society. Through the kindness of our Vice-President, Prof. Woods, it was held in the assembly rooms of the Ladies' College, and the teachers and pupils of the college added much to the pleasure of the evening by generous contributions of vocal and instrumental music. The guests were suitably received by Mr. R. B. Whyte, acting-President of the Club, and Mr. W. P. Anderson, President of the O. L. and S. S. An address of welcome was given by Prof. Woods, and there were also addresses by several of the Fellows of the Royal Society, including Dr. Wilson, Sir W. Dawson and Rev. Dr. Hamel.

The winter course of meetings consisted of six soirees and nine elementary lectures, or classes, as follows :—

Soirées.—January 13th, "President's Inaugural Address," Prof. Macoun. January 27th, "Our Ottawa Butterflies," Mr. Fletcher; Reports of Geological and Conchological Branches: "Note on Ottawa Salamanders," Mr. Latchford. February 10th, "The Development of the Mines of the Ottawa District," Mr. John Stewart; Report of the Entomological Branch; "Note on Flour and Grain Beetles," Mr. Harrington. February 24th, "The Great Ice Age and Subsequent Formations at Ottawa," Mr. H. M. Ami; Report of Botanical Branch, "Note on

the 'Maple Lung' as a Substitute for Yeast," Mr. John Stewart. March 3rd, "A Chemical View of the Metallic Minerals," Rev. Prof. Marsan; "Note on *Monotropa uniflora*," Dr. Baptie. March 10th, "The Puma or Mountain Lion," Mr. Lett; Report of Ornithological Branch; "Some New Species from the Trenton Formation," Mr. W. R. Billings; "Note on an Abnormal Specimen of *Calypso borealis*," Mr. Fletcher.

Elementary Lectures.—These were arranged to form, as far as possible, a consecutive course, while at the same time treating of as many branches as was found desirable. They were held every Monday afternoon, commencing January 17th, and ending 14th March. They were adapted especially for those entering upon the study of Natural History, but were instructive and interesting to all who were present. The subjects and lecturers were as follows:—"Insects Destructive to our Native Trees," Mr. Harrington; "Local Geology," Mr. H. M. Ami; "Our Introduced Weeds," and "Geographical Distribution of our Native Trees," Prof. Macoun; "How to Identify Minerals," Mr. Brumell; "The Forms of Leaves," and "The Forms of Flowers," Mr. R. B. Whyte; "Leaf-eating Insects," and "Flower Insects," Mr. Fletcher.

The Librarian's report will show you that many valuable publications continue to be received, principally in exchange for our Transactions.

A committee has been appointed to confer with the curator of the Museum of the O. L. and S. S., in regard to the specimens for which he may have accomodation. Some valuable specimens have been already promised to the Club to be placed in the Museum.

Transactions No. 7 (Vol. II., Part III.) have been printed and the volume is now completed. This part consists of 89 pages, and contains the valuable papers and reports read during the winter course of 1885-86. The two volumes contain in all 646 closely-printed pages, with eight plates descriptive of new species. They constitute a record of the Natural History of this locality, which is unapproached by any other in Canada, and which is probably equalled by few places on this continent.

The Council has, however, to express its regret that the publication of this number was unavoidably delayed, so that it was only ready for

distribution at the very close of the year. A similar apology was made last year by the retiring Council, with regard to the part published by them, and led to a lively discussion at the annual meeting as to the necessity of an earlier publication. Your Council was most anxious to carry out the wishes of the Club in this direction, but found it impossible to be more prompt than their predecessors. The question of future publication has, however, been carefully considered, and a scheme is now presented, which, if it meet with your approval, will ensure not only an earlier publication, but also a more complete record of the work of the Club, and bring it more prominently before the members and the public. It is proposed that publication shall be monthly, instead of annually, and there appears to be much in favour of this step, while the only objection seems to be the additional expense which may be involved. It is found that to publish a journal of 16 pages each month will cost about $100 a year over the average cost of the last three numbers of the Transactions. This sum will be readily raised if each member will use his or her influence in bringing others into the Club, or by inducing them to become subscribers to the proposed journal.

The following are some of the advantages which will accrue from the suggested method of publishing :—The members receiving the numbers regularly will have the objects of the Club kept before them, and as reports of all meetings, excursions, sub-excursions, soirees and other proceedings will be printed, in addition to the papers and reports now published, they will be kept posted as to the work being performed, and will have their interest therein aroused and strengthened. This will more especially be the case with such members as do not reside in the city, or are prevented from attending the excursions and meetings. These have now to wait for at least several months before they receive the Transactions, and they have no regular means of learning anything further regarding the excursions and classes than the meagre synopsis which appears in the Annual Report of the Council. Information can also be regularly given as to proposed excursions, soirees, classes or other undertakings of the Club. Kindred societies with which we exchange will see that the Club is vigorous, and desirous of making its publications

as valuable to them as possible, and therefore, worthy of assistance and encouragement.

The Council suggests that the journal be issued on the first day of each month under the title of "The Ottawa Naturalist."

You will learn from the Treasurer's statement that the present financial condition of the Club is perhaps more satisfactory than at any former period, and that there remains a good balance over and above all expenses. The Council has endeavoured to limit the expenditure of the past year in order that there might be sufficient funds on hand to warrant the adoption of the publication scheme which has been presented. The Treasurer has succeeded in collecting a very large percentage of the subscriptions, and it is expected that the few who are still in arrears will take an early opportunity to increase the fund which will be so necessary for carrying on this important project.

In conclusion the Council reiterates its belief that the present condition of the Club is encouraging, and that its future prospects seem to indicate increased strength and progress.

Signed on behalf of the Council,

W. H. HARRINGTON,

Secretary.

March 15th, 1887.

TREASURER'S BALANCE SHEET.

Dr. — *The Treasurer in account with the Ottawa Field-Naturalists' Club*, 1886-87. — *Cr.*

RECEIPTS.			EXPENDITURES.		
To Balance from 1885-86.....		$ 28 25	By Balance on Transactions No. 6, 1885-86.	$34 50	
Membership fees, 1885-86.....	$ 34 00		Plates for Transactions No. 6, 1885-86.....	15 00	
Membership fees, 1886-87.....	137 00				$ 49 50
		171 00	Transactions No. 7, 1886-87..		90 00
Sale of Transactions.....		6 55	Excursion Expenses.....		33 65
Excursion Receipts.....		34 80	Soiree to Royal Society.....		9 00
Soiree to Royal Society.....		7 50	Stationery		4 65
			Postage.....		7 23
			Miscellaneous Printing.....		19 15
			Balance on hand.....		34 92
		$248 10			$248 10

T. J. MacLAUGHLIN,

Treasurer.

PRESIDENT'S ADDRESS.

Prof. John Macoun, F.L.S., F.R.S.C., Etc.

(delivered 13th january, 1887).

Members of the Ottawa Field-Naturalists' Club, Ladies and Gentlemen :

Shortly after my election last year my duties called me away to London, England, where I remained eight months. In consequence of this I took no part in the field work of the Club during last summer. That I might judge of the work of other organizations doing work similar to ours, I attended meetings of the Croydon Field-Naturalists' Club and by this means am enabled to compare our mode of procedure with theirs. With that object in view I will give my impression of a trip to the North Downs, in Surrey, on Whit Monday, May 29th, 1886.

A large party, many of them specialists, assembled at East Croydon station about 9 a.m. and took the train for Oxsted, a village to the south of the North Downs. A tunnel of great length pierces the Chalk hills and only a few minutes elapsed before we were at our station about 14 miles from Croydon. Amongst the company were specialists in almost every branch of Natural History, and although most of those present were city men I saw at a glance they were widely different from the majority of those who attend our outings and belong to our city. Without exception every man entered into the business of the day with the zest of an enthusiast and went to work with a will. After a few moments' conversation it was decided that we should separate into smaller parties and meet for lunch at Buckley Clump, on the summit of the North Downs, which is a range of chalk hills lying between the Weald of Kent and London. We now separated into smaller groups, and while some kept along the main roads others went by lanes and paths through a beautiful and diversified country, while the party to which I attached myself rambled through the woods which covered the upper part of the slope, where we collected entomological and botanical specimens to our hearts' content.

Shortly after noon we all assembled at the "Clump" of beeches, and as we lay around in the shade or sat on mossy couches beneath the trees, eating our lunch and discussing the various beauties of the landscape, gentlemen acquainted with the topography and various villages

and country seats which lay at our feet or in the dim distance, pointed out everything of interest and explained every seeming difficulty, so that two hours passed away in the most pleasant and profitable manner.

The party now grouped themselves and an amateur photographer took pictures of the various parties. These were developed later in the summer and distributed to the various members. After this we divided into two parties, one of which was to return to Croydon by train, the other to walk across country through lanes and by-paths to Croydon, a distance of over 12 miles. My friends choose to walk and I perforce accompanied them. The remembrance of that walk will live in my memory as long as life lasts, for in it I made the acquaintance of English country scenery and Englishmen out for a holiday. It is not my purpose to describe English scenery, nor to enter into details concerning its beauties, but to point out the difference between Englishmen and ourselves, when on an excursion.

The average Canadian loves a pic-nic and delights to ride in a waggon along dusty roads to a point eight or ten miles away, eat a hearty lunch, take a short stroll, eat again, get into the conveyance, drive back to the city and talk about the Field-Naturalists' Excursion. The above is our plan. Can we not improve on this, and although we may ride out as usual, could we not do more walking and collecting and arrange for at least the active members of the Club making all-day excursions by going out ten or twelve miles from the city by rail or waggon and returning across country on foot.

While I do not wish to condemn ourselves for our want of desire to walk in the hot sun, I cannot help praising the Englishman for his enthusiasm in entering upon these excursions with a characteristic zest. If the excursions organized by us be fair examples of what is done in other parts of our country I should advise a new departure and strongly urge on the active members of the Club to form an inner circle and have excursions of their own where they can explore and investigate new districts and gather additional material for more fully elucidating the Natural History of our district.

The love of Natural History, which is self-evident in England, must arise from the familiarity of both young and old of all classes

with the various objects of Natural History found in public gardens and museums established in every part of the kingdom. That this is the case was shown by the almost universal custom of wearing flowers, making collections of Natural History specimens, or having pets of various kinds in the houses. While in England, however, I paid most attention to my own branch of science, and to botany will chiefly direct your attention to-night. To-day in every part of the world except Canada Botanic Gardens have been established. Economic and other museums have been called into existence and the natural vegetable products of the various countries are exhibited under the same roof. Many visits to the Royal Gardens at Kew, near London ; to the Botanic Gardens at Birmingham and at Dublin, convinced me that the present movement to establish experimental farms in Canada was a step in the right direction; but the cultivation of our native trees, shrubs and herbaceous plants should be considered of equal importance and receive special and prompt attention. In all of the gardens mentioned the native plants of each order are planted according to their relationships, and students and others can obtain a great deal of useful information without much labour or loss of time. When walking with botanists and others through the arboretums in England and Ireland I had to make the humiliating confession that in Canada we had no such thing, and that very few of our people knew one tree from another. You may think this unfair, but how many of us could tell the names of one quarter of the 65 species of trees growing without cultivation in Ontario. Besides the Botanic Gardens nearly every city has an Economic Museum in which are exhibited the various products used in the arts ; also the fruits, seeds, leaves, bark and wood of the native shrubs and trees, besides those of other countries.

Before I left for England I was told that a collection of small billets of wood was of little moment, and that our collection of birds would only cause laughter in the British Museum, where all these were represented. But what were the facts? When our 108 species of native trees were contrasted with 14 British species, and our magnificent display of game and other birds was studied by men who had visited every clime, a unanimous verdict was given in our favour.

My hearers may be surprised, but I am correct in stating that we made a far better exhibition of our Natural History in England than we do in any part of Canada, and it is a standing reproach to us that we have never yet had anything approaching to a complete representation, and more still, we have never had a place to put such a collection in if we had made it. It is altogether different in the United States. As that country has developed museums have been established, specialists appointed to take charge of the various branches, and to-day they have a staff of specialists second to none in the world, ready to tackle any subject of importance to the country.

A few years since the report got abroad that the fisheries along the American coast of the Atlantic were giving out. At once a commission was appointed and in the course of a few years reports were published giving every detail of the work, and not only reporting on the various species of fish but on their food likewise. The results of these investigations are placed in the National Museum at Washington. The raising of cattle on the "great plains" becomes a business of national importance, and a specialist to study the pasture grasses and a chemist are appointed and attached to the Bureau of Agriculture at Washington. Various diseases attack the growing crops, insects commit ravages, and in every case men are set to work to investigate, collect and classify; bulky volumes are published and the knowledge spread broadcast over the land, while the objects themselves are placed in museums for the instruction of the people. My work has caused me to come in contact with these specialists, and through them I have learned the value of these stores of Natural History and other objects which are being gathered together at Washington. It is painful to confess that all our best specimens, whether mineral, animal or archæological, are going to Washington, and the apathy of our people is such that I see no help for it.

I have learned the value of these collections, and my English visit has been so convincing that I consider silence concerning our position a virtue no longer, and take the present occasion of laying our case before an Ottawa audience in the hope that we may arouse attention to a question that is truly a national one. After much opposition the headquarters of the Geological Survey were removed from Montreal

to Ottawa and a museum was established, which to-day does honour both to its curators and the Canadian people. Owing to the immense collection of minerals and fossils brought from Montreal and gathered since, geology and mineralogy almost monopolize the limited space, and Natural History is left to take care of itself. At present a small room is devoted to mammals and birds, while the insects and plants of the Dominion are placed in the halls, there being no room for them elsewhere. At South Kensington we had a collection of mammals, birds, fishes and woods which did credit to the country, and yet here in our own Capital we have not room for a tenth of what was there exhibited. These collections are, at least in part, on their way here, and the question naturally arises, what will be done with them? This question is to be answered, and the public should speak and the citizens of Ottawa take action. Instead of having separate collections of minerals, fossils, vegetables, birds, fishes, mammals, etc., we should have one grand museum that would include every branch of Natural History and economic science, archæology, ethnology and geology; and were the proper representations made to the Government, we should see rising in some conspicuous part of our city a building designed for a museum, which would be the crowning glory of the greatest man Canada has yet seen or may see for a century—Sir John A. Macdonald —whose name since I was a boy has been a household word in Canada for progress in every direction. And now let him in his declining years give us a building for Canadian science which will be a credit to our city and a lasting monument to his enlightened statesmanship. I cannot here enumerate the many advantages which would necessarily be derived by the city and the country at large, through the establishment of such a museum, and can only refer to the vast benefits it would confer upon students and the citizens generally. In conclusion I would urge upon the Club the necessity of increased energy and activity. The desire and aim of the Club have ever been to encourage and enlighten the youth of the city on scientific subjects, and whatever position it may take on the question of amalgamation with the Literary and Scientific Society my warmest sympathies are with those who feel that they are both able and willing to take an independent stand and to shoulder the responsibilities such action may entail.

REPORT OF THE ENTOMOLOGICAL BRANCH.

To the Council of the Ottawa Field-Naturalists' Club :—

In entomological work we have to record some increase of activity. Sub-excursions were held weekly throughout the season, at which at least one of the leaders was always present. While valuable and extensive collections and records were made in nearly all of the orders of insects, the Hymenoptera and Lepidoptera received special attention. A few facts are given regarding the collections in each order.

Hymenoptera.—It was announced last year in the report of the branch that a number of species new to Canadian lists had been already collected at Ottawa, and that Abbé Provancher had determined some of the captures to be species new to science. He has since published in "Le Naturaliste Canadien" descriptions of many new species contained in the division Terebrantia, which includes saw-flies, ichneumons, gall-forming, flies, etc. In this extensive division the Ottawa collections have already yielded nearly 100 new species, besides many species not hitherto recorded from Canada, and some of great rarity.

The collections made during the past summer have as yet been only partially classified, but it is found that many species not formerly observed have been captured.

Oryssus Sayi, Westw. was found upon old maple trees near Hull, both emerging from, and ovipositing in, the dead trunk. The life history of these generally rare insects was, we think, not before definitely known. *Xiphydria albicornis* was again common in the city, where it oviposits in our maples, especially attacking the trees which have been newly set out along the streets. *Selandria rosæ*, the rose saw-fly or slug, was unusually abundant. At the recent excursion to Buckingham it was seen in large numbers, and on roses beyond Hull it was very destructive. In the city it did much damage. *Emphytus maculatus*, the strawberry-sawfly, also appeared to be more common than usual. *Messa hyalina* was bred in large numbers from the galls which cover and disfigure the leaves of the willows which have been planted by some of our citizens.

Lepidoptera.—The season was decidely a bad one for butterflies and moths. Bright, hot days were few, and when they did occur there

was generally too much wind for large collections to be made. On 22nd May an expedition was made to the locality for *Thecla Niphon* at Chelsea, and several specimens were secured. On the same day the spring broods of *Argynnis Bellona* and *A. Myrina* were observed, as well as the winter form *Hiemalis* of *Pieris Oleracea*. Good specimens of *Lycæna Lucia* and *L. Violacea* were also collected.

Several unsuccessful attempts were made to find *Fenesica Tarquinius* in the locality where Mr. Hanham found it abundantly in 1879.

On 1st July a sub-excursion of the branch visited the Mer Bleue where *Chrysophanus Epixanthe* and *C. Thoe* were collected in numbers, and the first specimen of *Grapta Interrogationis* was recorded for this locality. This species was subsequently bred in its two forms *Fabricii* and *Umbrosa* from larvæ collected on *Ulmus Americana*. The Theclas, usually so abundant upon the flowers of *Rhus Typhina* and *Asclepias Cornuti* in the first part of July, were conspicuous by their absence. This scarcity was also a noticeable fact concerning the common Clouded-Sulphur butterfly *Colias Philodice*. Not half a dozen specimens of the spring brood were seen, and it was very scarce in the autumn also. The only insect which was at all abundant was *Danais Archippus*.

A few interesting captures of moths have to be recorded. *Harrisimemna trisignata*, parent of the remarkable Zigzag Caterpillar, was taken at light, and *Platycerura furcilla*, a rare moth the larva of which feeds upon *Pinus Strobus*, was bred from larvæ taken last summer at Hull, P.Q. This locality still ranks amongst the highest as a rich collecting ground. Here *Ægeria exitiosa*, the peach borer, was observed by Mr. Harrington for the first time in this locality. The raspberry root borer, *Ægeria rubi*, was too abundant in many gardens at Ottawa. Some fine specimens were bred from garden raspberries, the canes of which were in many quarters badly injured. Cutworms were not so abundant as usual. *Hadena devastatrix*, however, was most frequently complained of, and did a considerable amount of damage. Another interesting species of this genus, *H. mactata*, was bred by Mr. Harrington from the flowers of *Cypripedium spectabile* which it had attacked severely in Dow's Swamp.

The item of most interest, however, which was observed during the past year was the increase and extension of the colony of the maple

—leaf—cutter, *Incurvaria acerifoliella*, which was mentioned in last year's report. This colony is in Beechwood near the cemetery and now covers more than double the space it did last year. Maple trees for a space of about 10 acres were during last autumn entirely defoliated by the minute case-bearing caterpillars of this moth. The perfect insect was taken at the excursion to Buckingham on 3rd June.

Diptera.—The season appeared to be very unfavourable for flies, and collections were correspondingly small. Mr. T. B. Caulfield, of Montreal, has determined for us a number of species, and we have yet many to be identified, before it would be advisable to publish a list. Endeavours will be made during the present year to enlarge our knowledge of this order. Mention may be made of the breeding of *Psila rosæ*, a small fly of which the grub bores in carrots, and which frequently does much injury to these roots. It has not been recorded previously from Canada.

Coleoptera.—The collections in this order include some additions to our lists. At the Buckingham Excursion a fine specimen of *Anthophilax malachiticus* was taken upon a birch tree in the grove near the river. At Meech's Lake specimens of a species of *Microrhopala* were taken on raspberry bushes. The species has not yet been finally determined, but this is the first instance of finding members of the genus in this locality. A number of other interesting additions was made to our local list.

Orthoptera.—Our members have hitherto somewhat neglected this order, which includes some of our common injurious insects. Mr. Caulfield, of Montreal, who is at present working in this order, has named a few species which were referred to him, and expresses his willingness and desire to examine any specimens which our members may wish to refer to him.

Hemiptera.—Collections in this order were small, but these contain two species not hitherto recorded in Canada. Abbé Provancher is now publishing in his magazine an account of the Canadian species and he has determined many of our specimens, and has still some in his possession for that purpose. So far, over 100 species are known to occur here.

NEUROPTERA AND PSEUDONEUROPTERA.—The work of collecting in these orders was vigorously kept up during the whole collecting season by several members of the Club with gratifying results. Many beautiful specimens of known species of both orders were taken. The insects belonging to Pseudoneuroptera were more largely represented, especially of the families Odonata, or Dragonflies, and Ephemerina, both of which were unusually abundant during the past summer. The full extent of the work accomplished will not be definitely known until a few of the rarer and more difficult species have been worked up. It is quite evident, however, that valuable additions have been made to the Canadian lists and that some of the insects now in hand will have to be described for the first time. Much greater difficulty is experienced in working up these insects than is the case with those of several other orders of Entomology, owing to the want of monographic descriptions, while the fragile nature of some of the specimens renders it very difficult to transmit them by mail.

W. H. HARRINGTON.
JAMES FLETCHER.
T. J. MACLAUGHLIN.

February 10th, 1887. Leaders.

TRANSACTIONS.—If any member, or correspondent has failed to receive any part of the Club's publications which should properly have been sent to him, a memorandum should be sent to the Librarian—Mr. T. J. MacLaughlin (Public Works Department)—notifying him of its non-arrival.

NEW MEMBERS.—1. A. P. Low; 2. D. E. Smith; 3. R. H. Cowley; 4. R. G. Code; 5. Arthur G. Forward; 6. Wm. Scott; 7. F. A. Gordon; 8. W. T. Lawless (Hull); 9. B. T. A. Bell; 10. John D. Evans (Trenton); 11. Thos. Gilmour; 12. J. T. Bowerman; 13. Robt. Gansby (Guelph); 14. James Clark (Renfrew).

LIBRARIAN'S REPORT, 1886-87.

To the Council of the Ottawa Field-Naturalists' Club :—

From the date of my accession to the office of Librarian to the present time, I have received in exchange for the Transactions of the Club the following, among other valuable publications :— * * *

(The list has been deemed too long for insertion ; it enumerates some fifty volumes received from thirty-five of the leading scientists and scientific bodies in Canada, the United States and England, including the Geological Surveys of the two first mentioned countries. Future contributions to the library will, under the present plan of publication, be announced monthly).

Our exchange list requires revision. Certain publications with which we formerly exchanged have ceased to exist. With others, not yet on our list, arrangements could probably be made which would result in several desirable additions to our library.

The free list should also be carefully revised. Not a few who receive our Transactions are so negligent as not to acknowledge the favour. I would suggest that the names of such persons be eliminated from the free list.

I desire to point out that the accommodation provided for our exchanges is altogether inadequate, and steps should be promptly taken to provide an additional book-case large enough to hold not merely the gifts we may receive during the next few years, but also the back numbers of our Transactions.

F. R. LATCHFORD.

Ottawa, March 14th, 1887.

REPORT TO THE ROYAL SOCIETY OF CANADA,

Read at the Fifth General Meeting, May, 1886.

In presenting to your Honourable Society the Fourth Report from the Ottawa Field-Naturalists' Club, the Council has great pleasure in being able to say that its work has been carried on with increased and gratifying success. The Club has at present over 170 ordinary and seven corresponding members, making it numerically one of the strongest Scientific Societies in the Dominion; and as regards original work performed by the members, it can compare favourably with any similar society.

The usual Excursions to places of interest in the vicinity were held at intervals during the summer, and many valuable facts concerning the Natural History of this district were recorded.

Much useful work was also accomplished at the Sub-excursions which were held on Saturday afternoons to points in the immediate neighbourhood of the city. These Sub-excursions are of the character of out-door classes, and are conducted with a view to enable the younger and less experienced members to study the different branches under the guidance of the appointed leaders, whose duty it is to give any assistance and explanation that may be necessary.

During the winter six Soirees were held. One was an evening devoted to the microscope, at which short papers were read and slides exhibited illustrative of the different subjects ; while at the others the following papers were read :—" The President's Address," Mr. W. H. Harrington; "The Black Bear," Mr. W. P. Lett; "Water Crystallization Effected by Magnetism," Mr. E. Odlum, (Pembroke); " A New Departure in the Study of Minerals," Rev. C. F. Marsan; " Ottawa Dragon Flies," Mr. T. J. MacLaughlin.

In addition, there were Reports from the Leaders, of the work done during the year in the various departments of Natural History, and notes by members. These, as well as the papers read, were followed by discussions of an interesting nature, which are a distinctive feature of the Soirees.

Afternoon lectures were also given during the winter on the following subjects :—

Entomology—Three by Mr. Harrington, two by Mr. Fletcher.

Mineralogy—One by Rev. C. F. Marsan.

Ornithology—One by Mr. W. L. Scott.

Botany—Three by Prof. Macoun, and two by Mr. R. B. Whyte.

The five on Botany were delivered before the students of the Normal School by request of Principal McCabe.

In addition to these lectures, and at the request of the Inspector of Public Schools for Ottawa, a weekly class in Botany has been organized as part of the regular instruction for the senior students at the Central School West. The attendance and attention displayed at this class have been most encouraging to the senior leader in botany who has undertaken the work.

The Council is much gratified to know that its efforts in the way of encouraging the study of Natural History are more appreciated. The attendance at the Soirees, the Excursions and the Classes, was larger and the interest shown by those present was much more marked than in any previous year.

A copy of the Club's Transactions No. 6, containing 132 pages and two plates, is herewith submitted, and we hope that it will be found a creditable addition to our list of publications.

At the annual meeting of the Club, held on March 17th, the following officers were elected for the year 1886-87 :

PRESIDENT—Prof. J. Macoun.

VICE-PRESIDENTS—R. B. Whyte and Principal Woods.

SECRETARY—W. H. Harrington.

TREASURER—T. J. MacLaughlin.

LIBRARIAN—F. R. Latchford.

COMMITTEE—Dr. Small, J. Fletcher, Rev. Prof. Marsan.

The following leaders have been appointed :

Geology—H. M. Ami, Prof. Marsan, H. P. Brumell and W. E. T. Sowter.

Botany—R. B. Whyte, Principal Woods and Dr. H. B. Small.

Entomology—J. Fletcher, W. H. Harrington and T. J. MacLaughlin.

Conchology—Hon. P. S. Poirier and F. R. Latchford.

Ornithology—W. L. Scott, G. R. White and J. M. Macoun.

Zoology—H. B. Small and W. P. Lett.

R. B. WHYTE, *Delegate.*

EDITORIAL.

The kindly reception accorded to the first number of the OTTAWA NATURALIST, by our members and correspondents, has encouraged us in our labours. There seems to be a unanimous opinion that the change in the time of publication is a step in the path of progress, and it has been especially welcome, as was expected, to non-resident members. In the present number we are able to give the very interesting address delivered by Prof. Macoun when President of the Club last year. There are many points in it well worthy of consideration, and we feel assured that his desire to see erected a museum worthy of Canada will be warmly endorsed by every reader. A number of new members have been elected since the Annual Meeting, but we desire again to urge all to endeavor to obtain among their friends further additions to our membership. The smallness of our annual subscription fee makes it the more imperative that our membership should be large, and that fees should be promptly remitted to the treasurer, in accordance with Rule 15 of the Constitution.

The Excursion Committee has recommended an Excursion to King's Mountain, Chelsea, on Saturday, the 21st of May. Our Excursions during the season will be conducted in accordance with the plan found to work satisfactorily in past years. Prof. Macoun informs us in his address that it is a common custom in English societies similar to our own, for excursion parties to go by rail or waggon to a locality several miles distant from the starting point, and then walk back "across country," collecting along the way. As indicated by him this plan has its advantages, but it seems to us that equally good work can be done under our own system of driving, or taking a boat, or train, both ways, and spending a large portion of the day in systematic collecting in the locality visited. In this manner many pleasant days have been spent by our members and their friends, and many important facts in connection with the Natural History of neighbouring districts have been discovered and recorded. A not unimportant advantage of returning together by conveyance, instead of in small scattering groups on foot, is the opportunity afforded for instructive conversation regarding the various interesting occurences or collections,

while at the same time needed rest is obtained after the fatigues of the day. In the Sub-Excursions, which are held on Saturday afternoons to more adjacent fields, we have true walking parties, composed both of those who have already done good work in the branches to which they devote their attention, and of those who, under their guidance, desire to enter upon the study of these fascinating subjects. It might, however, not be unwise for the leaders to act upon Prof. Macoun's suggestion, to have parties conducted upon the English plan, and consisting solely of workers. The Botanical and Ornithological Branches especially might find such tramps to afford opportunities for collection or observation, not offered by our present methods. As regards Entomology, Conchology, and probably Geology, it seems to us that much better work can be done by the careful examination of a limited area, than by traversing a distance of several miles, and making a necessarily imperfect scrutiny of the ground covered. As our Excursions are one of the important features of the Club's scheme of operations, it is desirable that they should be organized so as to contribute as largely as possible both to the store of knowledge, which we desire to gain regarding our local Natural History, and to the pleasure and instruction of those who attend them. We wish to make them a means of attracting people to the study of nature, and the Council will gladly receive from any one suggestions as to localities which might be visited.

The Botanical leaders ask for the observation and record of the foliation and flowering of our numerous species of plants, and particularly request information regarding the Polypetalæ. The Council has requested Mr. Fletcher to prepare for publication a catalogue of our plants with information as to the habitat of each species. On application he will furnish lists of species regarding which further knowledge is particularly needed, and we hope the members will give him their assistance toward making the records as full and precise as possible.

LIBRARIAN'S RECORD.

Since the Annual Meeting the following publications have been received in exchange for the Transactions of the Club :—

American Ornithologists Union : The Auk, Vol. IV., No. 2.

Canadian Institute, Toronto : Proceedings, Vol. XXII, No. 14.

J. A. Lintner, N. Y. State Entomologist : Report on Insects, etc., of Caledonia Creek, N.Y.; Some Sphingidæ of State of N.Y.; New species of Calocampa; New species of Grapta, etc.; Metamorphoses of Ceratomia quadricornis; Lepidoptera of the Adirondack region; Injurious Insects of the year 1878; New Principle of Protection from Insect Attacks; Circular No 1, October, 1883; Some Injurious Insects of Massachusetts; Insects of the Clover Plant; Some New Species of Nisoniades; New Species of Eudamus; Invasion by a Pyralid Insect.

The Essex Field Club, England: Transactions, Vol. IV, part 2; The Essex Naturalist, Nos. 1, 2, 3.

Cincinnati Society of Natural History: Journal, Vol. X, No. 1.

Torrey Botanical Club: Bulletin, Vol. XV, Nos. 3 and 4.

New York Microscopical Society : Journal, Vol. II, Nos. 9 and 9a.

Miss E. A. Ormerod : Report No. 10, on Injurious Insects; The Hessian Fly.

Entomological Society of Ontario : Canadian Entomologist, Vol. XIX, Nos. 1 and 2.

Sir Wm. J. Dawson, McGill University: Fossil Plants of the Laramie Formation.

Cambridge Entomological Club : Psyche, Vol. IV, Nos. 135-137.

J. B. Smith, National Museum, Washington : Revision of the Saturniidæ.

Johns Hopkins University : Circulars, Vol. VI, No. 56.

Natural Science Association, Staten Island : Proceedings, Extra No. 6.

Brooklyn Entomological Society : Entomologica Americana, Vol. II, No. 12.

ANNOUNCEMENTS FOR MAY.

Excursion.—The first General Excursion of the season will take place on Saturday, the 21st of May. The place selected for this excursion is King's Mountain near Chelsea, which has always been a favorite spot with our members. As no circulars regarding this excursion will be issued, except in the event of its postponement through any unforeseen cause, the members are requested to keep it carefully in mind. The Committee would like to have, not later than 19th, the names of all who will be present, in order that the requisite vans may be secured. Tickets may be obtained through any member of the Council at the following prices: Members 50 cents, non-members 60 cents, children 30 cents. The Club vans will start from the corner of Rideau and Chapel streets at 8.45 a.m. and from the corner of Sparks and Bank streets at 9 a.m. sharp. The council desires to see a large attendance of members and their friends. It is expected that the date selected will offer a very favorable opportunity for botanical collections.

Sub-Excursions.—The Botanical leaders have arranged the following Sub-Excursions for May:—Saturday, 7th, to McKay's Lake. Saturday, 14th, to Billings Bridge. Saturday, 28th, to Cave Creek, Richmond Road.

As in former years, they will leave the Post Office at 2 p.m. punctually. In addition early morning outings will be held, and those wishing to take part in such will please communicate with the leaders. Members interested in this Branch are requested to record the dates of the first and last flowering of plants, when they occur in greatest profusion, the localities where observed, and such other data as they may think of value. Information regarding the Polypetalæ is particularly desired, as it is the intention of the Council to issue a revised catalogue of local plants, the first portion to contain this division.

The leaders of the Geological Branch will attend the Sub-Excursion on 7th, and those of the Entomological Branch have decided to accompany the Botanists on 14th and 28th.

During the meeting of the Royal Society of Canada, which commences on 25th May, there will probably be a special Sub-Excursion of the Geological Branch, for Fellows of the Society interested in that science.

THE DEVELOPMENT OF THE MINES OF THE OTTAWA REGION.

Mr. John Stewart.

(Read 10th February, 1887.)

The mineral district of which Ottawa is the centre is a large one; including the western part of Quebec Province and the eastern part of the Province of Ontario. It is to this section especially that reference is made, although the following remarks apply to the whole of the provinces mentioned, and as regards the best interests of the miner, prospector or explorer, the saying "good and bad everywhere," may be put "bad and worse," and applied equally to them both.

The development of the mines has an important connection with the most complete knowledge of the minerals of only scientific interest; and this reason, and that of the injustice done to one section of the population, by those in power, are the apology offered for these remarks, which may appear to some to have too much of a technical bearing.

About two years ago, when some of these notes were made, there appeared in the newspapers of almost all parts of Canada, articles and correspondence under sundry headings, showing clearly that there is something materially wrong with the mining interest of these provinces as at present situated, that is, an individual ownership instead of Government holding the minerals for rental, or on lease.

Some writers attribute the lack of mineral development, and the stagnation of the whole industry (coal mining excepted) to the absence of a Bureau of Mining Statistics, or to a neglect on the part of the Geological Survey of Canada in not publishing reports of the extent of mining done each year. They saddle the Geological Survey with the total neglect of the mining interests, and find relief in considering it the "Scape Goat" in this case, and none try to arrive at a clear understanding of the position in which the mining interests of the provinces stand at the present time. Were statistics collected by the Survey they would tend to make more glaring the error in our laws as regards mining lands, give the number and acreage of our mining land monopolies, and show more clearly the error our Provincial Legislators have fallen into in selling the minerals with the surface soil to the

farmers. It is desired to point these out as the true causes of the lack of mineral development in this district and to suggest a remedy.

Others give as the causes the depending on a foreign market for our ores, extravagance and bad management, with an ill advised expenditure of too much money on the surface, before the mine is developed in depth, or to untrue and glowing promises, of "millions of tons of ore in sight" on the part of promoters of a new enterprise. There is no doubt that in some cases, these causes have helped to close the enterprise and deter others from embarking in a similar mine or property.

In Nova Scotia, Newfoundland and British Columbia, the Crown, or Provincial Government, owns the minerals, and issues licences to parties desiring to open and work mines, and in these Provinces the business of mining is largely and most successfully carried on. In Quebec and Ontario the minerals are at present sold along with the soil, and the birth right and portion of the explorer, prospector or miner, is thus given to the farmer, or, still worse, to the speculator in mining lands, and these sons of toil have to beg for terms from the miserly farmer, or independent and extortionate land owner or speculator. Mining lands have been sold in this way during the last forty or fifty years in Quebec and Ontario; some few, it is true, are being worked, but the great majority of the most valuable mining lands and mines are in the hands of speculators, or of parties who will not work them, and who ask for the mines and properties an exhorbitant price should an intending purchaser approach them.

This state of affairs, or the act of the Local Legislators selling the minerals, instead of giving a lease or license, and compelling the owner to work the mine or quarry, or have it revert to the Government, or exacting a low rent or royalty, under such *lea e or license*, from the profits derived from working the mine, is the cause of so many valuable properties being locked up, as it were, and development retarded, and the mining industry does not receive the attention it would, if these mining lands remained in the hands of the Government. In proof of this may be mentioned the vast amount of mineral land held by companies and speculators; in the Lake district and in eastern Ontario alone the area thus held amounts to many millions of acres of the best mineral

lands. The same is true as regards the phosphate region in Quebec. It is this system of unconditional sale of mining lands for speculation, without regard to yearly working, that has ruined the mining interests of this district. The error of any one party owning a large extent of mining land in a block, arises from the fact, which is well known to experienced miners and explorers, that by selling, say to an Iron Mining Company, a few thousand acres in a block, it gets other minerals, which it cannot treat, or the use of which it may not know, and the ores other than iron remain unworked.

Compare the system adopted in the Western United States, where a mining claim is given to the discoverer on condition that it is worked, or has labor spent on it to the extent of $100 each year; failing which it reverts to the Government. Under that system the right of discovery of the explorer, prospector, or miner, is respected, and a reward granted him (he can locate two claims), but in Ontario and Quebec, he has no rights, and he is, therefore, drawn to the more inviting fields of the United States. The location of the claim in the States is made by the discoverer on the ground, and is placed on record in the Land Office; but in this district it is made by a clerk in the Land Office, and not by the discoverer; a practice which has proved fruitful of the worst abuses and frauds on Canadian discovery. In the United States, by granting mining claims in that way, ore accumulated under the clause compelling at least so much work each and every year, and from its accumulation arose the necessity for milling or smelting works to work it up, and had the same inducements and compulsion been in force in Canada, our mines would have been counted by the thousand, instead of the few now in operation.

The chief ores of this region are: iron, (hematites and magnetic), phosphate, or apatite, and a large variety of pyrites, or sulphuret ores of the miners, holding in places copper, gold and silver in workable quantities, lead or galena, plumbago (black-lead), mica, and others of less importance.

The ores of iron are found in such variety and abundance that the only reason they are not now worked is the question of cheap fuel for reduction. Next spring certain tests of machinery are to be made, and should they prove as successful as former trials, this question will be

settled on a commercial scale, and the smelting of iron established in the district.

The apatite in the raw state is largely shipped to Europe, but the home demand for the superphosphate of lime for fertilizing purposes can be supplied from the works of the Brockville Chemical and Superphosphate Co. The pyrites used by this company for the last few years, for the manufacture of sulphuric acid, have been imported from New York State, but ores from the County of Hastings have been introduced to them, and the supply in future will be procured from local ores. The extended mining of the pyrites ore of the district is a question of much importance to the City of Ottawa, with its cheap water-power for dressing ores, and grinding apatite. The sulphur is used for treating the apatite in the form of sulphuric acid, and it would, if all we exported was shipped as superphosphate of lime, form an important industry. The residue of the pyrites ore can be most successfully treated after roasting, along with the lead ores, which we also have, and the copper, gold and silver extracted. Our lead ores are too poor in silver (about 5oz. or $5 per ton silver) to pay to work for silver and lead alone, but when smelted along with the residue of the sulphur ores, holding copper, gold and silver, the question of working both is settled.

The more extended production of gold also requires attention. No man has ever possessed too much of it, and no country has produced too much. Its value increases with the cost of getting it, and the want of it. It is our highest standard of money and exchange, and is therefore, when found in workable quantities, the best investment for *surplus* labor and capital. The discovery of gold in California and Australia produced periods of great world-wide prosperity. All classes and conditions of men were drawn to a new occupation and country by the high wages earned in the mines. A laborer who had been working for a farmer or a tradesman, for $1.00 or $1.50 a day, could wash out gold to the value of $10 or $20 a day. Can a wise adjustment of our mining laws be made to have this effect, if only on a much smaller scale, by granting free-grant mining claims in districts were gold is known to exist?

In iron alone, had such measures been adopted, there would to-day

have been enough mined and worked to supply our own wants and for exportation, as is done in Sweden and Norway with similar ores, climate and fuel (wood charcoal), as the laws of that country are such that no mining property can remain idle so long as any one desires to work it. In Sweden and Norway if a party owns a mine and is not working it, another party can do so by paying the owner half the profit of the working of the mine, and if he gives it up the owner or any other person can undertake to work it on the same conditions, hence no mining properties remain unworked.

In some European countries, and in some parts of the British Islands, the minerals are owned by the Crown, and at one time, even in Ontario, certain reserves of minerals were made in old deeds, but of recent years this is not the case.

Some may say, that in advocating the State owning the land, you are advocating communistic doctrines, but that is another question altogether; what is desired is for the State to own the minerals, which is British law and custom.

There are at the present time thousands of British and Canadian subjects in the United States mining regions who would take up claims in Canada were the laws such as would enduce them to do so, but at the present time there are no free-grant mining claims given and no inducements offered to explorers, prospectors or miners, to locate and develop a claim.

Under the present system 100 acres realizes to the government, say at $1.00 per acre, $100; and in ten years the country gets the benefit of the amount expended on that mine in labor, &c., if it is developed and worked, but if not, nothing. Under the system where the government holds the minerals, and gives grants free to miners, or on lease or royality, the country receives at least $100 per year for ten years, say $1,000 less the value of the 100 acres—$100, leaving a balance of $900 in favor of the free-grant or lease systems.

Under the lease or royalty system, in ten years the country receives the same as under the free-grant, together with the additional royality received when the mine is paying, which may be several thousand dollars yearly, and the increased value of public lands.

But it may be asked, from what source will the government

receive revenue for inspection and office expenses if they do not sell the lands as at present? The free-grants which proved paying mines, on arriving at that stage if charged a low royalty on profit, after working expenses are paid, would yield annually a larger revenue to the government than the present system of selling lots. In proof of this, the British Crown paid the Earl of Derby £50,000 stg. for the Isle of Man, and has been refunded from royalty on mines and quarries more than the sum paid for the island.

Compulsory working to hold a claim may be considered a small thing in an individual case, as regards the amount of labor employed, but take the returns for a province, or the whole Dominion, and it would amount to a large sum, on all the now known valuable minerals lots throughout Canada. In yearly doing a little on a mining property to hold it, new discoveries would be made, and new life given to what was possibly considered a doubtful prospect. It was in this manner that John W. McKay and other United States millionaires gained their first start. Through being compelled to work their claims they made a discovery which enabled them to sell or work it with profit. The mining interests in Canada will never prosper till similar measures are adopted. The custom of granting land to farmers under the free-grant system, and not giving an explorer, prospector or miner a free-grant, under conditions similar to that of the farmer, or of compulsory development of the minerals contained in the property is an injustice to the mining section of the population, and for that reason settlement has made progress and mining has not.

Some parties ask "but why give away a valuable mine as a free-grant?" A mining property in this section has no more value than the same amount of land, say $1.00 an acre, which you now give to the farmer. The miner would return $100 in labor each year, and develop the mine and prove its value, and if it proved valuable the Government would receive a revenue from royalty as long as it paid expenses. And some say: "What use would a free-grant be to a miner who had not money enough to purchase it at $1.00 per acre?" Under the free-grant plan both the farmer and the miner have energy and skill to develop the value of their claims, with proper provisions imposing on them a certain amount of work yearly, and that is worth

more to the country than to have so many dollars paid into the land office, and have the property lie in a state of nature and undeveloped.

There is a wrong system practised in Ontario and Quebec, the selling of mining lands by auction. When a valuable ore has been discovered in a section of country the excitement gets strong, and the land office is flooded with applications for lots, and to satisfy, not the discoverer, but contending parties, the properties are advertised and sold by auction, and the competition raises the price beyond that which a miner can afford to pay. The discoverer is not rewarded, and the property falls into the hands of a more wealthy man, a speculator, who will not work it himself, but purchases it on the chance of a rise in value, which fails to come, and the properties so sold remain undeveloped. The district ought to be opened as a free-grant mining camp, and the properties would be developed under proper mining laws and inspection, and the country receive many times more benefit than by selling it unconditionally.

The vast importance to a country of the proper development of its mineral wealth renders this subject one requiring the attention and careful consideration of our legislators and citizens.

IS MONOTROPA UNIFLORA A PARASITE?

GEORGE BAPTIE, M.A., M.B.

(Read, 3rd March, 1887.)

This note had its origin in a chance question put at one of Mr. R. B. Whyte's admirable afternoon lectures on botany. The discussion which followed showed that members of the Ottawa Field-Naturalists' Club were divided in opinion in regard to the parasitism of *Monotropa uniflora*, or Indian pipe, some holding the plant to be a parasite, others disposed to believe that it was not. Now, what is a parasite? It is desirable to know precisely what is meant by this term, because one person may mean one thing by it, another person may understand a different thing. To settle the usage a number of authors were examined. They mean by a *parasite* a plant which has an organic connection with another living plant, and thus derives nourishment from the latter. Parasites differ in the extent to which they draw sustenance from the plant to which they are attached. The relation may be illustrated by what is commonly known to be the relation between animals and their animal parasites. The parasitic plant bears the same relation to another plant that a louse or a tapeworm bears to the animal which supports it. A plant parasitic on another may be said to steal a part or the whole of its living, its food, from the plant to which it is attached.

To answer the question at the head of this note, the following plan can be adopted :—

We can consult standard books. This has been done. The authors do not agree. Macoun, Spotton, Wood, Gray, Goodale, and Balfour either positively assert that *Monotropa uniflora* is a parasite, or their language would lead a reader to believe it to be parasitic. Gray is self contradictory. Sachs speaks of monotropa as a saprophyte, and therefore not parasitic. By saprophytes he means plants which make use in their growth and development of the materials of other plants, dead ones, which are already in a state of decomposition. The position of Murray is this: "No case has yet been satisfactorily made out for the parasitism of this group (monotropa)."

Macoun and Spotton, 1879, page 6. "There are others whose roots penetrate the stems and roots of other plants and thus receive their nourishment, as it were, at second-hand. These are parasitic plants. The Dodder, Indian Pipe and Beech-drops of Canadian woods are well known examples." There is no doubt as to the meaning of these statements.

I now turn to Wood's Class Book, p. 30, and I find that he classes parasites under three heads, (1) parasites which appropriate stolen juices to their own growth, as the dodder and mistletoe; (2) parasites which, although standing in the soil, are fixed upon foreign roots and thence derive their entire sustenance, "as the beech-drops and other leafless, colorless plants;" (3) those fixed in the soil, like the last, but which derive from foreign roots a part of their sustenance, as the Geraidia. Wood's parasite is then essentially the parasite of Spotton. Let us now turn to our own particular plant. Of the sub-order Monotropa he uses these words: "Low, *parasitic* herbs;" of *M. uniflora* he says: "common in woods, near the base of trees, on whose roots it is doubtless parasitic." There is no mistaking what Wood says.

I now turn to Gray. Lessons 1877, p. 304. Of the sub-order Monotropa he says this:—"Parasitic on roots, or growing on decomposing vegetable matter like a fungus." Turn now to his Structural and Systematic Botany, 1877, p. 440, sub-order Monotropeæ: "*Parasitic* herbs, destitute of green color and with scales instead of leaves." This can give one idea and one only—but at page 91 of the same work occur these words: "It is probable that our Monotropa, or Indian Pipe, a pallid phænogamous plant, looking like a fungus, actually lives like one, and draws its nourishment, at least in great part, from the decaying leaves among which it grows." In his Botanical Text Book, 6th Ed. 1879, p. 38, he states the case as follows: "Pale or coloured parasites, such as Beech-drops, Pine-sap, etc, are those which are destitute of green herbage, and are usually of a white, tawny, or reddish hue, in fact of any colour except green. They strike their roots or sucker-shaped discs into the bark, mostly that of the root, of other plants, and thence draw their food from the sap already elaborated." In the Botanical Text Book, 1885, p. 338, we find that, "among the higher plants there are some . . . which derive all their nourishment from decaying

or decayed remains of other plants; while others like *Monotropa uniflora* . . . obtain part of their food from living plants."

In Balfour's Class Book of Botany, 3rd Ed., p. 848, the only statement I find is "Monotropaceæ; parasitic plants . . . chiefly found parasitic on firs in Europe, Asia and North America."

Sachs, translated by Bennett and Dyer, 1875, p. 620: "Parasites draw the products of assimilation directly from their hosts, while saprophytes (as . . . Monotropa, many fungi, &c.) make use for the same purpose of the materials of other plants which are already in a state of decomposition."

To add to the uncertainty it has been asserted that a connection has been observed between the monotropa and its supposed host. If so, that settles the matter. But as I am aware of only two cases in which this is alleged, may we not withold our assent until more observations have been made. It is possible the observers may have been mistaken, and any one who examines the root of *Monotropa uniflora* will find it is not at all like a parasitic root. This is only presumptive evidence; apart from this I have carefully looked for the connection between the monotropa and the root of some other plant upon which it might be fastened, but I have been unable to trace the connection. Perhaps the appearance of the plant has misled some observers, a colorless plant being commonly regarded as a parasite. This is an assumption. Monotropa is apparently without a particle of chlorophyll in its composition, and therefore has been *assumed* to be incapable of living and growing by making use of any food that has not been elaborated and prepared by a means of chlorophyll.

The analogy of the action of the germ in seeds, utilizing starch, oil, &c., contained in the seed for the growth and development of the very young plant, would give some encouragement to the contention that our monotropa *may* be able to use the organic matter of decaying leaves, &c., in its growth and development. The analogy may be set over against the assumption; but if it can be shown that our plant can grow and develop when only such material is supplied, the assumption should be abandoned as untenable. The following happened with me: A mass of soil and monotropa was put in a glass vessel, watered and set aside to await a convenient time for the examination of the roots,

to find, if possible, any connection with roots of other plants. While awaiting the examination new stems grew up and *developed*. This points to the view that the plant can do what it is frequently assumed a plant without chlorophyll cannot do.

Here is an opportunity for our club. During the coming summer all our members should keep a sharp watch on *Monotropa uniflora*, and by careful removal from the soil endeavour to trace any connection between it and its host, if it has any. Attempts should also be made to grow the plant from the seed and then try to make out its history; and by transplanting specimens and growing them in pots show whether they can live and grow independent of any connection with another living plant.

In the discussion which followed the reading of Dr. Baptie's paper, Mr. Fletcher said that he thought the subject a very useful one, because it gave the members an opportunity for investigation during the coming season. Conspicuous objects in the woods in spring were the beautiful seedlings of the beech, the plant upon which *M. uniflora* was alleged to be parasitic. These could be easily transplanted and grown in pots until the seeds of monotropa were mature, which might then be planted in the pot, some on the roots and some sprinkled on the soil. Careful attention would then surely reveal something of its nature. It was possible, he thought, that seeds might be found in the old pods of last year, if so the experiment might begin much earlier in the year. He suggested that parasites such as *M. uniflora*, where no connection could be detected between the mass of roots and any living plant, might be biennials, parasitic in the true sense for the first year, when all the energy of the plant was devoted to storing up a supply of nourishment underground, as do carrots, parsnips and other tuberous-rooted biennials. Subsequently the connection with the host-plant might decay leaving merely a mass of roots, at some little distance therefrom, stored with stolen nourishment, from which in the second year would be thrown up the flower-stems. Such a mode of growth would account for Dr. Baptie's plant continuing to develope after removal from its natural habitat.

EXCURSION TO KING'S MERE.

On Saturday, the 21st of May, the first excursion for 1887 was held. The day dawned bright and warm, and at the appointed hour of 9 a.m. a large gathering of members and their friends assembled at the corner of Bank and Sparks streets, where the Club vans were to start from. A few minutes later six large covered vans were closely filled and took their departure for King's Mere. Across the Suspension Bridge they rolled, and their occupants had a good opportunity of seeing the Chaudiere Falls at the period of "high water" in the Ottawa. At Hull the main street was found to be impeded for its entire length with a trench blasted in the solid rock, for the laying of water pipes, and by the resulting mounds of stone, as well as some ridges of ice which had been protected by debris; a detour was thus necessitated and the party emerged through the C. P. R. station-yard on to the Chelsea Road. After the payment of somewhat exorbitant tolls, there was a stretch of several miles of macadamized road and then turning down through Old Chelsea the road ran through a pretty piece of woodland, containing some splendid butternut and other hardwood trees. Pleasant as was the drive, everybody was delighted when the pretty little lake known as King's Mere was reached and the vans halted at its upper end. Several persons who had been unable to go in the vans arrived soon afterwards, and the total number of those present was found to reach 119, making the excursion the largest ever held by the club. As soon as the numerous baskets, collecting boxes, &c., had been removed from the vans, the President, Mr. R. B. Whyte, announced that at two o'clock those wishing to ascend the mountain were to gather, and that at 4.15 the entire party would re-assemble for the purpose of hearing the usual addresses, from the leaders of the several branches, on the collections and observations of the day. The party then broke up into numerous groups, which sought out shady places under the clumps of trees upon the mountain foot-slope, and proceeded to discuss with sharpened appetites the contents of numerous baskets, obtaining clear, cool and sparkling water from a spring near by. At the appointed hour the President headed the company, which desired to ascend the mountain, and the advance was made along an

easily ascending foot-path, through a pleasant little valley, across a small brooklet, and up the wooded, flower studded hillside, until the bare, massive, rocky summit was safely won. The view, though extensive, was greatly limited by the hazy, smoky atmosphere, due to bush-fires resulting from the prolonged drought, and while the Ottawa River could be seen the city was obscured, and many points of interest hidden. Mr. H. M. Ami, with a fine aneroid barometer, kindly loaned by the Geological Survey, found the elevation to be 910 feet above the Hull Station, or 1,125 feet above sea level. No less than seventy-five persons ascended the mountain, perhaps the largest gathering ever upon its summit. The descent was easily made, and collecting renewed along the way, the botanists returning with well filled vasculums and baskets. After a brief rest Mr. Ami gave a short instructive address upon the various geological formations occurring between the city and the mountain, and mentioned that the latter was composed of rocks particularly interesting, from the fact that they belonged to the oldest formation in the world, that known as the Laurentian. Mr. Fletcher, the senior botanical leader, then spoke in an interesting manner of a few of the principal plants observed, and the lessons that might be derived from a study of them. The first one mentioned was the beautiful *Clematis verticillaris*, a climbing plant with large showy blossoms, worthy of a place in our gardens with many others of our handsome native species. *Aquilegia canadensis*, or the Canadian columbine, is also a fine plant, with its bright flowers showing frequently against the stones and shadows of the roadway. The habits of *Comandra umbellata*, a parasitic plant, were explained, and specimens were shown which had been found attached to the roots of wild cherry, *Prunus virginiana*. Attention was called to the flowers of *Acer pennsylvanicum*, or striped maple, and to the often-overlooked fact that the flowers of other maples and various forest trees are very beautiful. Mr. Harrington made a few remarks on insects, calling attention first to the great abundance of the very injurious forest-tent caterpillar, as evidenced by the webs seen so frequently on the apple and other trees along the road. By destroying these webs early in the season while they are small the increase of this noxious insect would be much checked. Some information was given as to the habits of our native bees, which are mostly solitary

in their habits, which were seen in great abundance around the trees in blossom, such as apple, cherry, hawthorn, &c. The President then made a short address, urging the claims of the Club to support from the members, and from all those who take an interest in science and education. The Club had endeavoured by the publishing monthly of the *Ottawa Naturalist*, and by excursions, classes, &c., to foster a love of nature and arouse and strengthen the faculties of observation in those it could reach, and, therefore, deserved encouragement. At 5.30 a start was made and the homeward trip was pleasantly made, conversation, instructive and interesting, with intervals of song enlivening the way, until the city was reached about 8 p.m. This, as already stated, was the most successful excursion of the Club, and all present were well satisfied and pleased with their holiday.

SUB-EXCURSIONS.

First.—The Saturday afternoon "outings" commenced on the 7th May, when the attendance reached the very encouraging number of thirty-three, including a majority of the Council and many active workers, among whom were several ladies. Starting from the Post-Office at two o'clock the party proceeded to New Edinburgh by the street car. Here the Geological section separated temporarily from the Botanists and Entomologists, who proceeded to the woods beyond Rideau Hall, popularly known as McKay's Bush or Beechwood. Along the shaded road and under the cedars there were still heavy banks of snow, but in the open spaces and hardwood groves the ground was quite dry, and such flowers as Claytonia abundant. The list of plants collected in flower was, however, small, while insects were very scarce, only the species usually found about fungus, sappy stumps, &c., being taken. About 4.30 the party re-assembled near Rideau Hall, to listen to the "talks" upon the collections in the various branches. The President, Mr. R. B. Whyte, took up the plants and in an interesting manner explained the leading peculiarities and relations of the principal species. Of these the rarest were *Daphne mezereum* and *Viola Selkirkii*, for which the only locality recorded was that just visited. Mr. Whyte's remarks were listened to with much pleasure, especially by a number

of new members who have evidenced an active interest in botany. Mr. Harrington made a few remarks on the habits of the humble-bees, several of which—chiefly *Bombus ternarius*—had been observed. These were all females which had survived the winter and were now searching for suitable spots for the foundation of colonies. Some nests of leaf-cutting bees (Megachile) were exhibited, and the method of their construction explained. Mr. H. M. Ami reported the proceedings of the Geological section. Along McKay Street, near the south-east corner of the Rideau Hall grounds, an outcrop had been examined of a band of impure limestone, ten to twelve inches thick, which was highly bituminous, and fossiliferous, both overlaid, and underlaid by soft, friable shales, all of Utica age. It contained the following species: *Leptæna sericea*, *Orthis emaceratu*, *O. testudinaria*, *Zygospira modesta*, *Metoptoma sp.*, *Calymene senaria*, and *Asaphus Canadensis*, of which the Metoptoma is new, not only to this formation but perhaps to science, the genus not having been recorded from this formation either in the United States or Canada. At excavations on Creighton Street strata were examined which also belonged to the Utica, and which consisted of five bands of impure bituminous limestone, alternating with five bands of shales, the whole aggregating over six feet in thickness. The following were among the most interesting fossils: *Leptograptus flaccidus*, *Leptobolus insignis*, *Schizocrania filosa*, *Conularia Trentonensis*, and *Leperditia sp.* (perhaps new). An outcrop of Trenton limestone yielded *Streptelasma corniculum*, *Murchisonia gracilis*, *Strophomena alternata*, &c. An interesting fault occurs near this outcrop, which brings the Trenton and Chazy formations into contact. Some crinoidal limestones near the tobogan slide were also examined but yielded no specimens. The party then returned to the city, having derived much pleasure and instruction from their outing.

Second.—On the 14th May Billings' Bridge was visited. A party of forty-seven was conveyed from and to the city by two large vans, while a group of eight geologists proceeded by boats to Hog's Back, thus making in all fifty-five; the largest sub-excursion yet held by the club. The Botanical section was, as usual, very strongly represented, and the collections were much larger than those of the previous outing, although vegetation was found to be still very backward. After exploring the

vicinity of the river the party re-assembled near the Episcopal Church and was addressed by Mr. Fletcher, as the Leader in the Botanical section. He expressed himself as much pleased at seeing the sub-excursion so well attended, and so much interest shown in the specimens collected. He said that the unusually late spring had rendered the quantity of specimens small; but as is always the case for those who will use their eyes, there was far more to be found than could be studied. He spoke enthusiastically of the pleasures to be derived from a study of the floral gems of the woods, the most insignificant of which would form an ample theme for a whole lecture. The most interesting plants collected during the afternoon were then referred to. The history and uses of some were related, and the structure of others was explained. Instructions for collecting and preserving certain plants, such as the willows, claytonias, orchids and other succulent plants were given. It was announced that the Botanical section would hold sub-excursions throughout the season, and that at each a short lecture would be given by one of the leaders. Mr. Ami then explained the formations observed by the geologists at Hog's Back, and the fossils by which they were characterized, after which the party returned to the city.

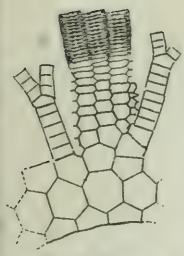
ANNOUNCEMENTS.

Excursion.—The second excursion will be held on Saturday, the 25th June, when a visit will be paid to Aylmer. There are in the neighbourhood of this place very suitable collecting grounds for Botanists, Entomologists, &c., while interesting formations are exposed for the Geologists. The train by which the party will go leaves the station at 1.15 p.m., and the train leaves Aylmer at 8 p.m. Tickets will be 25 cents each.

Sub-excursions.—The Botanical and Entomological Leaders have arranged for the following Saturday Sub-excursions in June: 4th, to Beaver Meadow, Hull; 11th, to Hemlock Lake, Beechwood; 18th, to Dow's Swamp; starting on each occasion from the Post Office at 2 p.m.

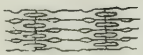
New Members.—15, Charles H. Beddoe; 16, Charles Magee; 17, Henry Grist; 18, Miss Eliza Bolton; 19, George Hay; 20, Dr. C. . Wilson (Buckingham); 21, Miss Katherine Lee; 22, Dr. George Patterson (New Glasgow, N.S.); 23, Miss L. Rothwell.

The Montreal Natural History Society holds its Annual Field-day at St. Jerome on Saturday, 4th June, and has sent a cordial invitation to be present to any of our members who may be able to join them there, or at Ste. Therese *en route*.



Part diagram

Posterior side



Lower plates of ventral tube enlarged

Dendrocrinus proboscidialus. *E. Billings. 1857*

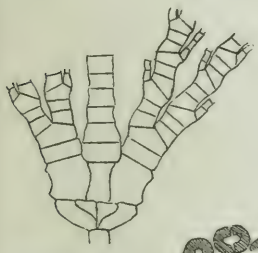
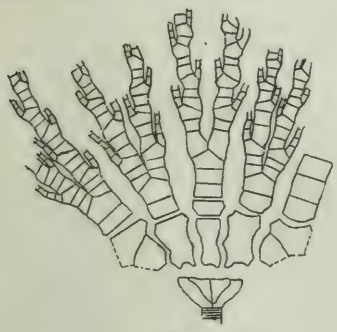


Diagram of anterior side

Section at level of secondary brachials

Diagram of posterior side

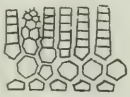
Calceocrinus rugosus. *n.sp.*



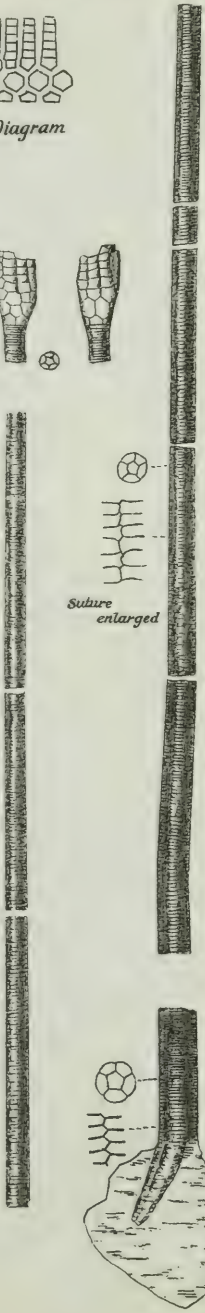
Diagram

Calceocrinus furcillatus. *n.sp.*

Ottawacrinus typus, *n. gen. et sp.*



Diagram



Suture enlarged

A NEW GENUS AND THREE NEW SPECIES OF CRINOIDS FROM THE TRENTON FORMATION WITH NOTES ON A LARGE SPECIMEN OF DENDROCRINUS PROBOSCIDIATUS.

Walter R. Billings.

(Read, 3rd March, 1887).

OTTAWACRINUS, *n. gen.*

Cup, obconical.

Underbasals five; pentagonal.

Basals five; one pentagonal, two hexagonal and two heptagonal.

Radials five; four simple and one—the right posterior—compound. In the type species three are pentagonal, one tetragonal and the compound made up of a heptagonal followed by a pentagonal plate.

Arms five; composed of tetragonal pieces. No pinnules.

Anal plate heptagonal resting on the posterior basal and the lower plate of the right posterior radial—as in Dendrocrinus—and supporting a ventral tube which, so far as seen, is composed of horizontal rows of hexagonal pieces which alternate with those in the adjoining rows.

This genus is most nearly related to Dendrocrinus, from which it principally differs in the shape and size of the right posterior basal; the shape of the posterior basal, the right anterior basal and the posterior radial; and in the arrangement of the plates of the ventral sac, which are in vertical rows in the latter genus.

Although the type specimen of this genus was discovered at Hull, Ottawa County, P.Q., I felt justified in naming it as above owing to to the fact that, when referring to the Trenton Formation of this district, naturalists use the general term Ottawa Canada.

OTTAWACRINUS TYPUS *n. sp.*

Cup, slender, obconical, 0.2 inch in height, tapering from 0.12 inch at base to 0.17 inch at base of arms. Surface of plates smooth.

Underbasals five; pentagonal, sub-equal.

Basals five; the posterior, left posterior, right anterior and left anterior are large—the largest plates in the cup—and the right

posterior is small. The left anterior and left posterior basals are hexagonal, the posterior and right anterior heptagonal and the right posterior pentagonal.

Radials five, four being simple and one—the right posterior—compound as in Dendrocrinus; the anterior, left anterior and left posterior are simple and pentagonal, the right anterior simple and tetragonal, and the right posterior compound and formed of a heptagonal plate followed by a pentagonal one. Following each radial is a series of tetragonal, primary brachials, with parallel sutures, of which but five are preserved in any arm of the only specimen collected. The brachials are wider than high tapering slightly upwards, the lowest piece of each arm being nearly or quite as wide as the radial below it.

No pinnules observed.

Anal plate heptagonal, resting on the posterior basal and the lower plate of the right (compound) posterior radial; followed by horizontal bands of hexagonal pieces, the plates of each band or zone alternating with one another, and not in vertical rows as in Dendrocrinus.

Column pentapartite throughout, with a pentagonal canal, the angles corresponding with the sutures, which are directed radially. In section the column is quinquefoliate at the root, passing up into circular at the base of the cup. The portions figured do not represent the whole, as some pieces aggregating several inches in length were lost subsequent to the collection of the specimen. The aggregate length of column preserved is nearly ten inches, tapering from 0.18 inch at base to 0.10 inch, at 0.50 inch below base of cup from whence it expands to 0.12 inch at its junction with the cup. At the base of the column the the longitudinal sections are composed of flat segments of equal thickness which alternate with those of the adjoining sections instead of abutting; this portion with its root-like branches, having identically the appearance of the radix figured in Decade 4, G.S.C., as that of *Rhodocrinus asperatus*. At a short distance from the radix these segments are divided by thinner and projecting ones which gradually become wider until they equal the others; while the vertical sutures change gradually until the segments abut instead of alternating.

Collected by the author at the City of Hull in the Trenton

Formation, associated with *Hybocrinus conicus, Heterocrinus canalensis, Pleurocystites elegans, Streptelasma, corniculum, &c.*

GENUS CALCEOCRINUS, HALL.

As there appears to be only conjecture for the assertion that the plates upon which this genus was proposed are congeneric with the species afterwards assigned to it by Meek and others* the following new species may have to be assigned either to Chirocrinus, Salter, or Euchirocrinus, Meek.

Wachsmuth and Springer represent the genus as having three arms. I am satisfied, however, that there are four.

There is no previous record of a specimen having the column basals and radials in the same straight line as is found in *C. rugosus*, described below.

CALCEOCRINUS FURCILLATUS, *n. sp.*

Only one side—the anterior—of the basal series observed; the posterior resting against the posterior radials as is usual in the greater number of the specimens of this genus. The basal series is semilunar, the chord being under the three radials of the anterior side. The basal portion, as seen on the anterior side, is divided into four pieces: first, by a vertical suture into halves, which are again divided by a line sub-parallel with the curved margin making two outer plates which, together, are rudely crescentic, and two subtrigonal inner plates.

Between the basal and the radial plates, on the anterior side of an exceptionally perfect specimen of his species *C. punctatus*, Prof. Ulrich "found a large number of small and irregularly distributed plates." These minute plates are absent in my specimen; but there exists a vacant space in which such an assemblage could easily find place.

There are five series of radials, aggregating—so far as known—eight pieces, of which three series with four plates are on the anterior side and two series with four plates are on the posterior. On the anterior side there are three alternating with the basals; the middle radial being composed of a tetragonal piece, $2\frac{1}{2}$ times as high as wide,

*See revision of the palæocrinoidae, by Charles Wachsmuth and Frank Springer, part 3, page 273; and also remark on the names Calceocrinus and Cheirocrinus, by Prof. Ulrich, in Report of Geological Survey, of Minnesota, 1886, page 104; both of which should be read by all interested in this genus.

supporting a wider hexagonal piece which is twice as wide as high and rests on the flat upper side of the tetragonal piece and on one of the sloping sides of each adjoining radial. The two outer radials of the anterior side are hexagonal, are larger than the middle one, extend mid-height of the second middle radial piece and are proportionately wider than the first middle piece. At the upper end of each of these outer radials is a wide middle face which supports the first arm piece of that ray, and two sloping sides, one partly supporting the second middle radial piece of the anterior side and the other a plate of the posterior side. The radial series of the posterior side are somewhat obscure; but four plates forming two radial (or a radial and an anal) series can readily be made out. The lower plates do not extend quite as low as the anterior radial series, and are subtrigonal with the angle adjoining the base of the anterior series truncated, which truncation with the free portion of the adjoining anterior radial forms a notch in which the corner of the united basals plays in doubling itself back on the posterior surface of the cup. The upper plates of the posterior radial (and anal) series are hexagonal; one side resting upon its fellow, one on the sloping side of the adjoining radial of the anterior side, one abutting on the first arm piece of the adjoining anterior arm, one carrying a plate of the next series (arm or ventral tube), one abutting its twin posterior radial (or anal), and one whose relations are not made out. I do not find any line of junction between these plates and the basals nor any collection of small plates there although such may exist. Prof. Ulrich calls the posterior radial and anal plates the ventral arch in which he finds three plates in his *Cremacrinus punctatus* and eight in his proposed genus *Halysicrinus*, but in both the species of *Calceocrinus*, herein described, there are four plates arranged as above stated.

Each of the arms consists of a primary and a secondary series of plates. The primary series consists in the middle arm of the anterior side of three plates, and in the others of two; the uppermost in all cases being an axillary piece. The secondary series of each arm is composed of rounded pieces, longer than wide, bearing pinnules or armlets on alternate sides, beginning on the outside. The pinnules are slender, but their joints are equal in length to the corresponding arm-joints.

The pinnule-bearing arm pieces are swollen or c'aviform at the joints, which are oblique so that the articular facet of the two arm pieces and the articular facet of the arm piece and pinnule are at right angles to one another.

The left posterior radial (or anal) piece carries the basal plate of a ventral tube of which but three pieces can be made out in the type specimen, owing to the folding of the arms over the upper portion.

Collected by the author at Division Street, Ottawa, in beds of the Trenton Formation.

CALCEOCRINUS RUGOSUS, *n. sp.*

This species has the same arrangement of the plates of cup and arms as *C. furcillatus*, excepting that the central arm of the anterior side of this species does not appear to be bifurcated; there being in the only specimen which I have examined five plates of the primary series but no axillary piece.

In the specimen described, the basals, radials and arms, are all in the same straight line, so that both sides of the basal plates can be observed. A piece of the column which was in the same line as the other portions was lost while cleaning the specimen.

The basals at the lowest point have a broad facet for the articulation of the column, and from thence a marginal lip is carried each edge of the posterior side, across which a ridge is carried, immediately opposite the vertical suture of the anterior side, to the middle of the line of articulation with the series above, thus dividing the posterior side of the basals into two concave surfaces. The posterior side of the basal series shows no sutures.

All the plates have punctate surfaces.

The primary radials have each a deep transverse furrow which with ridges at the sutures produce wrinkles. The arm-plates and pinnules are stouter than in *C. furcillatus*.

Collected by Mr. W. R. Smith at Belleville, Ont., in a stratum of the Trenton Formation, containing *Porocrinus Smithi*, *Pleurocystites quinquesus*, *Dendrocrinus Jewettii*, &c.

DENDROCRINUS PROBOSCIDIATUS, BILLINGS, 1857.

The specimen figured was discovered last autumn, at Division street, this city, by Mr. Wm. H. Jenkins of Madoc, Ont., who kindly

loaned it to me for description. Its large size and the preservation in it of portions not well shown in the type specimen make it of special value. Comparison with the type specimen and with a small specimen collected by the author at Division Streee, leads me to believe that the specimen figured belongs to this species.

The specimen lies on a slab with the posterior side upward, showing a portion of the column, the posterior side of the cup, two arms and the ventral tube. Three pentagonal under basals are visible, also the heptagonal posterior basal, hexagonal left posterior basal, a part of the right posterior basal, the radials and arm-plates of two arms, and the ventral tube. The posterior basal is heptagonal and the right and left posterior basals hexagonal. The right posterior radial is compound, consisting of a pentagonal and a hexagonal plate, and followed by seven tetragonal and one axillary brachials. The left posterior radial is pentagonal and followed by five tetragonal and one axillary brachials. Of the secondary series three consecutive tetragonal pieces is the largest number preserved in either ray.

The anal plate, which rests on the truncated posterior basal is heptagonal, abutting by two sides on the right posterior radial and by one on the left posterior radial. Of the three remaining upper sides two carry two adjoining series of the large bottom plates of the ventral tube and the third, which is short, supports one side of the bottom plate of an adjoining series. The plates of the two rows of the ventral tube which are supported by the anal plate are hexagonal, resting on each other by their longest side and alternating with those of the adjoining rows. The pieces are about as wide as high at the base of the tube, but as they rise they become shallower, while retaining their width, until at the sixth plate the height is one-third the width, whence they reduce regularly until one inch from the anal plate, where the upper part is unfortunately broken off. The upper plates of this specimen show the commencement of the sculpture and its transition towards the pattern shown in that part of the tube which in the type specimen is intact. The row of ventral tube plates to the right of those described is similar to them, but rests on the second plate of the compound radial and abuts on the first brachial. Another row further to the right and which rests on the first brachial is composed of smaller plates. The lower portion of the ventral tubes is thus seen to be articulated with the right posterior ray as high as the top of the first brachial.

The column is quinquepartite with sutures radially situated: the periphery of the section is stellate with the sutures in the re-entering angles; and the canal is pentagonal with the angles on the lines of the sutures.

REPORT TO THE ROYAL SOCIETY OF CANADA.

(Read at the 6th General Meeting, May, 1887.)

It is again my privilege to report to you that the Ottawa Field-Naturalists' Club, which I have the honor of representing, still continues to fulfil satisfactorily the objects of its organization, by the fostering of a love for nature and the working up and taking permanent records of all facts connected with the Natural History of the Ottawa District; and this in such a way as to induce all, and particularly those now securing their education in our local institutions, to direct some of their attention to these most interesting and important pursuits. With the latter object in view special efforts were made by the Council of the Club to arrange for the delivery during the past winter of Free Elementary Lectures in all branches of Natural History, not only before the members of the Club, but also, whenever opportunity offered, in the Public Schools. It was a great encouragement to find how popular these lectures proved, and how the attendance steadily increased day by day, as they became better known.

Some important changes were made in the working of the Club at the beginning of the current year; the most notable of these was the publication of a monthly magazine, instead, as heretofore, of the yearly volume of Transactions. This magazine, THE OTTAWA NATURALIST (copies of which have been regularly sent to your honorable Society as issued), contains the papers and the reports of the leaders in the different sections, which were read at the Soirees held during the past winter, and also accounts of all the excursions and sub-excursions held during the month previous to its issue, as well as notices of all matters of interest to the members for the coming month.

The sub-excursions referred to above differ from the general monthly excursions of the whole Club, in being under the direction of one or more of the leaders in the section, and are in reality working parties or classes, those present devoting their whole attention to their own specialties under the guidance of teachers whose duty it is to show the best mode of collecting and studying, and who, during the present year, will deliver short lectures in the field upon the objects collected each afternoon. This plan, as far as we are able to judge from the present season, has been eminently successful.

The winter course of meetings consisted of six soirees and nine elementary lectures, as follows :— * * * *

(The remainder of the report consisted of lists of the papers and reports read at these meetings, and of the officers and leaders for the current year : As this matter has already appeared in THE OTTAWA NATURALIST it is not necessary to republish it.)

R. B. WHYTE,
Delegate.

LIBRARIAN'S RECORD.

The following publications have been received as donations, or in exchange for the transactions of the Club :—

Royal Society of Canada : Transactions, Vol. IV.

Geological Survey of Canada : Maps for Annual Report, 1885.

Essex Field Club : The Essex Naturalist, No. 4.

Entomolcgical Society of Ontario : Canadian Entomologist, Vol. XIX, Nos. 4 and 5.

North Staffordshire Naturalists' Field Club : Annual Report, 1886.

Winnipeg Board of Trade : Annual Report, 1886.

Torrey Botanical Club : Bulletin, Vol. XIV, No. 5.

Botanical Gazette, Crawfordsville : Vol. XII, Nos. 3 and 4.

Peoria Scientific Society : Bulletin, 1887.

Brooklyn Entomological Society : Entomologica Americana, Vol. III, Nos. 1 and 2.

W. D. Dimock, B. A. Truro : The Year Book of New South Wales, 1886 ; New South Wales, Its Progress, Present Condition and Resources ; First Progress Report of Royal Commission on Vegetable Products, Victoria ; Catalogue of Exhibits of Western Australian Court ; Notes on the Aborigines of Western Australia ; Select Extra, Tropical Plants ; Notes on Western Australia ; Catalogue of Oil Paintings and Water Colour Drawings of the Victoria Court ; Malta and its Industries ; Catalogue of Malta Court at the Colonial Exhibition ; Forest Protection and Tree Culture on Water Frontages ; Metamorphic and Overlying Rocks in Ross and Inverness Shires ; Rocks, Minerals and Fossils, exhibited by Victoria Court at Colonial Exhibition.

SUB-EXCURSIONS.

THIRD.—On the 27th May about thirty members and their friends met at the Post Office at the usual hour—2 p.m. Those connected with the geological branch proceeded, under the leadership of Messrs. Ami and Stewart, to examine certain exposures near the Queen's Wharf and Rideau Hall, having with them Professors Bailey and Mathews, of New Brunswick, who had been in attendance at the meetings of the Royal Society. The rest of the party—nineteen in number—preferring the botanical and entomological branches, made a visit to Cave Creek. This is but a small stream and is interesting only from the fact that it disappears under ledges of limestone at a short distance in the rear of Judge Ross's house and re-appears at about an equal distance on the opposite side of the Richmond Road, having an underground course of several hundred feet. The fields and woods in the neighbourhood were explored, and plants and insects collected. About four o'clock the party gathered under a spreading maple to listen to the "talks" of the Leaders. Mr. Fletcher urged the value of botanical studies from an economical as well as scientific standpoint, and explained the object of making collections and the methods which should be pursued in their subsequent study and investigation. He then discussed several of the plants collected during the "outing," pointing out the distinctive features and showing that in many instances the scientific names were descriptive of these characteristics, and that a knowledge of the derivation and meaning of the names was consequently often of considerable assistance in determining species. Mr. Harrington followed with a few remarks on the insects observed. Of these the most conspicuous and handsome were two fine examples of the Luna moth, *Attacus luna*, which had been found by a young lady. *Selandria rosæ*, the rose-sawfly or slug, had been seen on bushes in the garden of Judge Ross. Twigs of larch were shown which had been last year attacked by another sawfly, *Nematus erichsonii*, but the insects were apparently not yet ovipositing this season. *Calosoma calidum* was mentioned as the largest Ottawa representative of the Carabidæ, a family of beetles whose habits were briefly explained as predatory and beneficial. Examples of one or two other families were also exhibited,

and their habits noted. The audience seem much interested in the remarks of the Leaders, and many points brought forward were more fully discussed on the way homeward.

Fourth.—The botanical and entomological branches visited the Beaver Meadow, near Hull, on 4th June, their being present eighteen persons. This locality is one of the richest collecting grounds in the district, and the collectors secured many interesting specimens. On gathering at 4.30 p.m., Mr. Fletcher, for the benefit of several who were entering upon the study of botany, described the apparatus necessary for the preservation of specimens, and the methods of treatment which he had found most suitable for different classes of plants. His large experience enabled him to give some very valuable hints as to the care of specimens in special cases, as when traveling, etc. The President, Mr. R. B. Whyte, then spoke on several of the plants gathered, showing how the species fell into certain families, although sometimes the members of a family differed greatly in appearance. He took the Ranunculaceæ, as being the first family in botanical classification, and discussed four species belonging to it. Of the genus Smilacina (Liliaceæ) three species had been collected out of the four which occur at Ottawa. The yellow lady's slipper, the wild-rose, the climbing honey-suckle, and other interesting or rare plants were also exhibited. Mr. Harrington, in his remarks on insects, drew attention to specimens of Thalessa, explaining that they were the largest of the ichneumons, or parasitic hymenoptera, and describing the method of oviposition of the female, and the difference in the appearance of the two sexes. *Xiphydria albicornis* was stated to be injurious to maples in the city, frequently attacking small transplanted shade-trees. A very pretty dragon-fly (*Calopteryx maculata*), several specimens of which had been seen flitting about the brook, had the very curious habit of going down some distance beneath the surface of the water for the purpose of depositing its eggs at the base of the weeds. The beneficial habits of an allied insect were also mentioned. On the way back to the city the members had a good opportunity of seeing several specimens of *Thalessa atrata* and *lunator* ovipositing in an old sugar-maple.

Fifth.—On the following Saturday—11th June—a party of

twenty-five visited New Edinburgh. The geologists examined a number of waterworks' excavations, and the botanists and entomologists rambled about Hemlock Lake in search of treasures. The usual "talks" were given on re-assembling near Rideau Hall; Mr. Ami speaking first as geological Leader. Several excavations on Creighton street had been visited, which exposed Utica shales, highly bituminous and rich in fossil remains. Some good specimens had been secured by various members, including species probably new to the local lists. Mr. Harrington drew attention to the manner in which the upper portions of the palings of the Rideau Hall fence were scraped, and explained that this was the work of our large wasps, which utilized the fibres of the wood for making the paper of which they composed their nests. After making some further remarks on the habits of these interesting insects, he exhibited specimens of the two species of tent-caterpillars, *Bombyx disstria* and *Americana*, pointing out the distinctive markings and their beauty. Mr. Fletcher, in a very lucid and interesting way, explained the characteristic features of the following plants, and pointed out how certain of them might be distinguished from closely allied species: *Linnæa borealis*, *Sanicula canadensis*, *Medeola virginica*, *Orchis spectabilis*, *Senecio aureus*, *Arabis perfoliata*, *Rhus toxicodendron*, *Viburnum acerifolium*, *V. pubescens*, *Acer saccharinum*, do. var. *nigrum*, *A. pennsylvanicum*, *A. spicatum*, *Arenaria serpyllifolia*, *Pelea gracilis*, *Carex longirostris* and *Fraxinus americana*.

Sixth.—On the 18th June a very pleasant visit was paid to the Experimental Farm. It had been the intention of the leaders to first visit Dow's Swamp, but, through some misunderstanding, the vans engaged did not appear at two o'clock, and when they were obtained it was so late that it was deemed best to drive straight to the Farm. The geologists were left temporarily at a quarry near the St. Louis Dam, while the remainder of the party kept on to the residence of the Director, Prof. Saunders, who received them very cordially. After a few minutes rest and conversation, those who desired to collect were conducted by the Professor to a wooded tract near by, where, for an hour or so, they hunted assiduously and with good success. After this a time, only too brief, was devoted to inspecting the work accomplished

on the Farm, and then the entire party assembled at the Director's house for the addresses which had been announced. Besides those who had arrived in the vans, several had subsequently come, making in all sixty members and friends. There were besides Professor and Mrs. Saunders and the members of their family; Col. Blair, who will conduct the Experimental Farm in Nova Scotia, and Mr. Gibb, of Abbotsford, well-known throughout Canada as a most successful fruit-grower. The President, Mr. R. B. Whyte, stated the pleasure it afforded him to see such a good attendance at the sub-excursion, and, for the benefit of those who were not regular attendants, he explained the object of these "outings," and the useful work accomplished by them. Before calling on the leaders for the usual lectures on the collections, he took much pleasure in announcing that word had been received only that day that one of their members then present had been the recipient of a well deserved honour, and should be known to them hereafter as Sir James A. Grant. This gentleman, in addition to his eminent standing in his profession—that of medicine—had a wide reputation as a scientific man, and especially as a geologist. He had ever been a promoter of scientific knowledge in Ottawa, and his connection with the Ottawa Field-Naturalists' Club showed that he still desired to be identified with the work. The announcement of this distinction was hailed with much pleasure by all present. Mr. Ami then gave a brief outline of the geological formations of the immediate neighbourhood, explaining that they might be divided into two series of three each. He described the geological ages to which these belonged, and pointed out where they occurred. Specimens of several interesting fossils where exhibited, which had been obtained at the quarry mentioned. Mr. Harrington regretted that it fell to his lot to discuss the insects when the Director of the Farm was so much better qualified to do justice to the subject, he having been for many years President of the Entomological Society. It was an unfortunate fact that the Club numbered so few members giving any attention to entomology, and this made it very difficult to speak on insects so as to interest those present. Specimens of galls made by insects belonging to various orders were exhibited, and attention was called to the very interesting results which followed the deposition of the egg in the growing plant, whereby its forces were so

diverted as to produce a characteristic gall. Mr. Fletcher, as botanical leader, used as illustrations for his lecture, amongst others, *Cypripedium spectabile*, the Showy Lady's Slipper, a beautiful orchid which grows in the swamp near the Farm, *Blitum capitatum*, the Strawberry Blite, and *Polygonum ciliinode*. The chief points of interest of these plants were explained, and the lessons which might be derived from them were referred to. The Erigerons were spoken of, and the easiest means of distinguishing the species was pointed out. Plants which unfolded their flowers at special hours in the day were alluded to, and *Silene noctiflora* and *Œnothera biennis* were exhibited and their most important characters noted. A fine specimen of the Raspberry Rust gave a pretext for describing some of the fungi parasitic upon higher vegetation, and some of the methods which might be used to keep them in check. Prof. Saunders was then called upon to enlighten those present as to the work which had been accomplished upon the Experimental Farm. This he did in a most pleasant and graphic manner, showing that since the beginning of operations, on 2nd May, remarkable progress had been made in clearing the ground and in planting. The Farm consisted of about 465 acres, of which, the Club was glad to learn, 65 would be set apart for a park, where the trees, shrubs and smaller plants of Canada would be found grouped by provinces; as well as many from foreign countries, arranged according to their place of origin. On the remaining area all kinds of grains, roots, fruits, etc., would be raised and tested. Already an immense number of trees had been set out, and an almost innumerable variety of plants could be seen in various stages of growth, many of which came from Russia, Japan, and other distant lands. After outlining the future work and aims of the Farm, Prof. Saunders expressed the hope that the Club would make further visits to it and examine its progress. By special request of the Council, Sir James Grant made, in his usual eloquent and happy manner, a short address, stating that when he had commenced the study of geology in Ottawa science had but a scanty following. He was pleased to find it now attracting so much attention, and to belong to a society which was doing so much for the development of a knowledge of natural history as was the Field Naturalists' Club. The Experimental Farm would be, he was con-

vinced, a source of the greatest benefit, not only to the agricultural interests, but to those of science and general progress. At this stage of the meeting refreshments of a very tempting character were distributed by Mrs. Saunders, who had been most unremitting in her kindly attentions to those present during the afternoon. As the usual hour of returning home had some time gone by, Prof. Woods was deputed by the Council to offer the thanks of the Club to Professor and Mrs. Saunders for their kindness and hospitality. This task performed in appropriate terms, the party embarked for the city, thoroughly pleased and satisfied with their "outing."

EXCURSION TO AYLMER.

The second excursion of the season was held on Saturday, the 25th June, when a party of forty-eight went out to Aylmer by the 1.15 P.M. train. Upon arrival at that village the President, Mr. R. B. Whyte, announced that the geologists, under the guidance of Mr. Sowter, would examine certain exposures of rock in the vicinity, while the remainder of the party would proceed a short distance along the shore to Blueberry Point (below the village). This was found a most charming place, offering a rich and diversified flora to the botanists, and the attractions of the lake-shore to those who preferred to loiter there. Happily the majority of those present desired to make investigations into the natural history of the locality, and they were soon scattered around assiduously collecting and examining the many objects of interest. Even those who were not of a scientific turn found two plants of much interest growing in grateful abundance—the strawberry and blueberry. As the afternoon wore on the collectors, with well-filled vascula, formed groups under the shade of the pines near the beach, and examined and discussed their finds. By five o'clock all were once more assembled and the President, calling the meeting to order, requested the Leaders to enlighten them in regard to the collections. Mr. Fletcher, as botanical leader, stated that although it was the object of the Club to give to all the "outings" the nature of "classes" as well as mere collecting parties, no systematic course of study had been deemed advisable. The more interesting specimens collected had been

explained, and following this course he would take at random a few species and point out in what way they were noteworthy. *Habenaria Hookeri* was taken as a type of the orchids, a group of plants noted for the strange forms of their flowers. The structure of the various organs was lucidly explained, and the manner in which they were adapted for the purpose of enabling the fertilization of the flowers to be effected through the agency of insects. The manner of propogation from the root was also described. The differences apparent between the two species (*Pinus strobus* and *P. resinosa*) of pines growing near at hand were explained. The red-pine had its leaves in clusters of two, while those of the white-pine were in fives : the cones were also easily distinguished, and the trees were unlike in general appearance. *Ilex verticillata* was described as being a holly, having red berries which persisted upon the bushes after the leaves had fallen, and which might be preserved for Christmas decorations. *Carex lupulina* obtained its specific name from the resemblance of its flower to that of the hop. The carices were distinguished from the grasses in having triangular stems and leaves in whorls of threes. *Rosa blanda* was our commonest wild rose and was distinguished by the paucity of prickles upon its stems. Another rose which had been found, but of which the flowers were nearly over, was *R. carolina*, or the swamp rose which grew along the banks of streams, and in other moist localities. The fruit of the teaberry (*Gaultheria procumbens*) was an enlarged calyx, and retained the cup-like shape of the flower, it persisted during the winter and sometimes to the following autumn ; the berries of one year being found with the flowers of the succeeding one. *Œnothera pumila* was the only species of our evening primroses which so far departed from the habits of the group as to open in the morning. *Lilium philadelphicum*, which had been found in large numbers, was the only lily yet found growing near Ottawa. It was a very handsome plant, the tall slender stem being surmounted by a large showy blossom, the structure of which was fully explained. A few other plants were noted, and the members were greatly interested by, and derived much valuable information from, Mr. Fletcher's discourse. Mr. Harrington, one of the entomological leaders, set forth the advantages accruing from the study of the science of entomology ; showed how intimately it was

connected with that of botany, and how desirable it was that botanists should have some knowledge of it. The red-pines of the vicinity had been attacked by a small beetle, *Dryocœtes affaber*, which had worked considerable injury, by boring in the terminal shoots and in the young cones; another beetle, a small weevil, was probably the cause of gall-like swellings upon the small branches. Several species of galls found upon willows and poplars were exhibited, and attention was also drawn to a peculiar flower-spider, the caterpillar of the large black swallow-tail butterfly, and other insects. Mr. Ami explained that the geological formation of the vicinity was that known as the Chazy, and described the sandstones, shales and limestones composing it, and the fossils which had been obtained from them. Several ladies had assisted in the examination of these rocks, and one of them had found a fossil of peculiar interest and rarity. Owing to the lateness of the hour Mr. Ami made his interesting remarks very brief, in order that there might be time for the members to take their tea before the departure of the train, by which the party returned home, at 8 p.m.

ANNOUNCEMENTS.

Excursion.—The third excursion will be held on Thursday, the 21st July. The place to be visited is Buckingham, the picturesque scenery of which locality has, on previous occasions, elicited the admiration of the members, while rich collecting grounds, of large extent, are to be found. The steamer *Empress* will leave her landing, known as the Queen's Wharf, an 7.20 a.m. The Council hopes that all the members who can possibly do so will attend.

Sub-Excursions.—The Botanical and Entomological Leaders have decided upon the following Saturday outings for July: 2nd, to Hull; 9th, to Dow's Swamp; 16th, to Rockcliffe; 30th, to Beaver Meadows, Hull; starting from Post Office at 2 p.m.

New Members.—24, Miss Alice Bowen (Quebec); 25, R. Gervase Elwes, *M. Inst. C.E.*; 26, Mrs. Elwes; 27, Miss Annie M. Fowler; 28, Judge W. A. Ross; 29, Miss Maggie Thomson; 30, Samuel S. Reveler.

THE GREAT ICE AGE AND SUBSEQUENT FORMATIONS AT OTTAWA, ONTARIO.

By H. M. Ami, M.A., F.G.S.

Among the most interesting and captivating subjects which attract the attention of even a casual observer in the realms of geological science, few are so full of interest and afford so much information as researches amongst the most recently deposited strata. Besides this interest, there is carried with it the fact of its practical importance, so that the economic aspects of the question have likewise to be taken into consideration.

There are numerous questions which press themselves one upon the other in examining the marls, sands, gravels, clays, boulders and kindred materials which constitute the Post-Tertiary deposits of a district. The following are some of the more important questions which we will attempt to consider with regard to our own locality:—

At what period in the Earth's History did the Glacial Epoch or the Great Ice Age make its appearance?

What were the causes which led to it, what phenomena characterized it, what was its duration and what traces did it leave behind? And again, specially, to what extent was this continent submerged, for how long, and what traces of animal life has that period left behind it; and, further, are there unquestionable proofs of a period of subsidence followed by another of elevation carrying us on to the present day, during which time numerous and varied lacustrine or alluvial deposits were laid down, and in the lapse of which man made his appearance.

Then, in which of the newer deposits are traces of the existence of certain tribes of the American Indians to be found? What are these traces? To what extent do they assist in forming an estimate of the degree of civilization to which these aborigines attained? What customs and modes of life are exemplified by the implements of various kinds found in what has been very appropriately termed the Human Period? At what time and for how long did these inhabitants occupy the land before the intrusion of the whites, and what was their history?

These are only a few of the more salient problems to which reference will be made.

It may not be thought amiss to note first what has already been done in the field of research with which we have to deal. In the "Geology of Canada," 1863, a report by Sir Wm. Logan and staff—there is a chapter on "superficial geology" in which a number of interesting notes are recorded from Ottawa and its environs, an examination of which had been entrusted to Dr. R. Bell. Then comes the work done in the Post-Pliocene geology of Ottawa by Sir J. A. Grant who produced a number of valuable papers, some of which were published in the United States and others here in Canada. At the mouth of and along Green's Creek, six miles distant from the city, and a favourite resort for students of Post-Tertiary geology, Sir J. A. Grant and Sir W. Dawson made important discoveries. The collections of the late Dr. E. Van Cortland show that he also devoted considerable attention to these interesting deposits, whilst the late Mr. E. Billings in his Canadian "Naturalist and Geologist" published notes on the same subject. The above mentioned work was prior to the organization of the Field-Naturalists' Club which has since vigorously pushed investigation in this direction. Nearly a score of members, have taken a more or less active part in these researches, whilst the abundance of work and material make it probable that greater attention will continue to be paid to the deposits in question. The work done already is considerable; but there remains a hundred-fold more to do. Mr. Surtees, the City Engineer, has been carrying on an extensive series of excavations in all parts of the city. These excavations or trenches are dug or blasted out to a depth ranging from eleven feet to eighteen feet six inches, so that deep and interesting sections have been exposed.

For the description of the Post-Tertiary or Post-Pliocene (Pleistocene) deposits it is first necessary to ascertain whence the material came which composes them, and in order to do this it is obviously necessary to examine the older rocks of the district, and to see of what their measures consist, and know the stratigraphical relations existing between the various members of these older underlying series.

Just as we have a great diversity of formations about Ottawa, so also have we a great diversity of substances in the materials which make up the rock of the Post-Tertiary deposits, (and let it be borne in mind, that in using the word "rock" it is used in its true geological sense, so that a handful of sand, a lump of clay, a mass of pebbles, cemented or not by finer detritus, are all as much "rock" as a pillar of freestone, a block of limestone or a column of granite). Most of the materials which are found in these newer deposits were derived from the older formations of the district, whilst erratic blocks, and the like, may have come from great distances. To go into details regarding all the kinds of rocks met with, would necessitate a protracted study of a great quantity of material which years of labour could not exhaust, and which would form the constituent elements of all the formations from the Laurentian to the Hudson River as they are developed in the "Ottawa Basin;" from the gneissoid, granitic and hornblendic rocks of the former, to the shaly magnesian and arenaceous measures of the latter. There would be the gneisses, pegmeties, crystalline limestones, serpentines, dolomites and diorites of the *Lower Laurentian*, occurring at Chelsea in the Laurentide Hills, there would also be included portions of the conglomerates and quartzites and calc-bearing sandrock materials peculiar to the unconformably overlying *Potsdam* and *Calciferous* formations, whilst the sandstones, shales and limestones of the *Chazy*, followed upwards without a break by the impure calcareous strata of the *Black River* and *Trenton* formations would all be mixed together with the likewise conformably overlying bituminous schists of the *Utica*.

The materials which compose the series of formations just mentioned and newer than the Laurentian were themselves derived from the Laurentian System, for this latter contains all the elements necessary for the formation of the sandstones, shales and limestones of the newer overlying Cambro-Silurian or Ordovician strata.

Having ascertained the series of strata whence the material was obtained which constitutes the various beds in the Post Tertiary deposits, let us consider the condition of affairs previous to and at the coming in of the Glacial Epoch.

This portion of the American Continent, which, during the earlier palæozoic period had alternately been submerged and elevated, remained in this latter state a long period of time, during which denuding agencies, such as atmospheric erosion, rain and other solvents carried away a great deal of material. This is a lapse of time, which, in other parts of Canada and elsewhere, is marked by a regular ascending series of newer formations deposited, for the most part, beneath the level of the then existing oceans, a period embracing within itself the whole of the Silurian and Devonian systems, together with the Carboniferous age or the coal measures. The Palæozoic Era thus ended Mesozoic times came in and the Triassic, Jurassic, and Cretaceous systems followed, overlying which all the Laramie and Tertiaries were laid, all of which are entirely absent in our district marking a great unconformity between the Glacial deposits and the Hudson River rocks about Ottawa.

The *Glacial Epoch* or the *Great Ice Age*, then, is the first of the series of Post Tertiary times, with which we have to deal, as it rests immediately upon, though with discordance of stratification (if that term may be employed here), and overlies the Cambro-Silurian and older formations in this district. Just previous to this period of glaciation, and whilst it lasted, there must have taken place a great elevation in this part of the North American continent, so that an extreme Alpine or Arctic climate was the natural result. Nor was this part of America the only one which enjoyed this particular state of affairs, but throughout the greater portion of North America as far west as the Great Missouri Coteau, in Europe, and in other continents, evidence of extreme cold, the result of great elevation, has been ascertained beyond doubt. Prof. Favre, of Geneva, whose admirable researches in Alpine geology have made him so famous the world over, in the "Résumé" of his "Geological Researches in Savoie and the neighbourhood of Mt. Blanc," points out clearly what was the origin of the glacial epoch in that part of Europe. "The amount of moisture or humidity," he says, "with which the atmosphere of Europe was filled on account of the elevation of land subsequent to the deposition of the tertiary deposits—the cooling effect of the neighbouring mountains, then more elevated than now-a-days—together with many other causes, led to a reduction in the temperature of the atmosphere resulting in an abundant

precipitation of snow on the leading peaks of the region." So in Canada, and in the Ottawa district, a great reduction in the temperature followed the great elevation, and immense quantities of snow, ice and water followed and glaciers were formed all over the district—a vast mer-de-glace covered this portion of Canada, whose height above the ocean level of that period was considerable. These glaciers, like modern ones, were characterized by many interesting particulars which a study of the latter can afford. The number, direction, movements, thickness, erosive or denuding power and the constituent parts of a glacier, or a system of glaciers, are questions full of interest. It has been ascertained that over four hundred glaciers can be seen in the central portion of the Alps, from Mont Blanc to the Tyrol, some of which are only three miles in length, whilst others exceed twenty miles from head to foot or from the point of origin to the snout. There is abundant evidence to show that the number of glaciers which must have existed here about Ottawa is very considerable. Perhaps the greater number, were subordinate or small ones and may, at length, have been absorbed in and formed part of "a great glacier." The direction in which they moved depended of course on the nature of the district, its physical or orographical character. The general trend of the great mer-de-glace in Canada during this epoch has been ascertained to be approximately N. E. and S. W. With regard to the direction of some of the glaciers, the striations or grooves on the rocks about Ottawa show that in some cases they travelled almost due east and west, as may be seen along Park Avenue, on Nicholas street and in other parts of the city, at other times they appear at a considerable angle to this direction, bearing almost due north and south, as at Buckingham on the Lièvre River. Regarding their movements and the speed with which glaciers travel, we consult Agassiz and find that he obtained the following results in 1841 and 1842 on some of the Aar glaciers :—

	ANNUAL MOTION.
I. Finster Aar—	
Stake near centre of glacier	269 feet.
" side "	160 "
II. Lauter Aar—	
Stake nearest centre of glacier	245 "
" side "	124 "

whilst at *Chamonix* the ice near the shore of the *mer-de-glace* was found to move as follows, from June 29th to June 8th of the following year :

From	June 29	to	Sept. 28	.....	132 feet.
"	Sept. 28	"	Dec. 28	.....	70 "
"	Dec. 12	"	Feb. 17	.....	76 "
"	Feb. 17	"	April 4	.....	66 "
"	April 4	"	June 8	.....	88 "
			Total (in less than one year)	.....	432 feet

This would average over five hundred feet or about one-tenth of a mile in twelve months. The rapidity in the motion of a glacier, of course, depends upon the nature of the obstacles to be surmounted, as well as to a great extent upon the time or month of the year, different portions of the same glacier moving at different rates. A glacier which decends into a valley below, or discharges itself into a sea or arm of an ocean, does not necessarily lose any of its length, for whilst its snout is being melted and carried away to warmer portions, the head or initial point is ever receiving additional snow and ice to supply it constantly, and only a subsidence of the continent could produce a change in the climate of such an ice bound district.

We have no data existing here or traces left by means of which we can calculate the rate of motion of the glaciers about Ottawa during the great ice age, suffice it to say that as in the case of modern glaciers their rate of travelling varied at different times. Then as to the thickness of the great ice-mass which then invaded this district, that is a problem which to a great extent, has yet to be solved with us, nevertheless, let us examine the data at our disposal in reference to this interesting phenomenon. Taking the Ottawa Valley, in and around the city, as a typical example of a valley of erosion with subordinate branches, we see that facing the river and the north, there occurs a series of high "bluffs" or cliffs where the strata are clearly seen along their sides to be throughout nearly horizontal.*

That these beds could not have been deposited in such a position is beyond question, so that the prolongation of them northward must at one time have existed. What was it then, which removed all these and

*There are but few exceptions to this, due to dislocations, faults and folds in the strata, of purely local origin, but not of general significance in this problem.

to such a depth? This very question gives us a clue to one factor at least in the estimate of the powerful ice-mass which, coming from the West or W. N. W. struck down upon the shales and limestones of the formations here to be found. It also gives us data to estimate its thickness. The occurrence of striated rocks at the top of old Barrack Hill, where the Parliament Buildings now stand, shows that as that cliff is one hundred and eighty-seven feet above the level of the river, and over two hundred feet above the level of the bed of the river, the mass must have been much over two hundred feet. Further, in order that a mass of ice or a glacier carrying boulders and detritus—*moraine-profonde*—can groove and polish the rocks of a district to such an extent as was the case here, the superincumbent weight and attending pressures must have been enormous, and from what is known of present glaciers, whether in alpine or arctic regions, we know that its thickness must have been very great. A fair estimate, we believe, of the thickness of the glacier or mer-de-glace extending over our city and its environs during the glacial epoch must have been very little short of one thousand feet, if indeed that number is not too small. The erosive or denuding force of glaciers has as yet only casually been touched upon, for when we take into consideration the millions of tons of material which have been removed from even the small area about our city, it is marvellous to know where it all went. You can hardly find a loose rock or boulder in the fields without seeing written upon it indubitable marks of scratching and grooving, which, along with millions of others were held firm in a mixture of cementing clay and sand (to a small extent) carried forward upon the floor of the glacier and ground one against the other, at times, to such an extent that all angularities and rough points were removed and the boulders left smooth and polished. The striations, grooves and polished surfaces of rocks which up to this date attest clearly to the fact of the existence of those glaciers, besides the boulders themselves, may be seen not only in the places already mentioned, but at the corner of Sussex and Rideau streets, where there is an interesting exposure.

The effect of these glaciers upon the softer shaly strata of our neighbourhood is clearly shown in such a deposit of the Utica shales as is met with at Cumming's Bridge, on the Rideau River, or at the corner of

Maria and O'Connor streets, some 12 feet below the surface of the roadway. At these two places, whilst the shales of the Utica formation also occur *in situ* and undisturbed at a greater depth than is visible in either section, the uppermost measures of the section exposed and examined cannot certainly be said to be strictly *in situ*, as the beds are tilted at every conceivable angle, crushed and broken, and in the overlying glacial deposits are to be found some of the boulders themselves which assisted intilting and disturbing these once horizontal measures.

There occur a vast number of faults and dislocations in the measures of the Trenton and other formations about Ottawa, great breaks, which at times, run more or less parallel to each other and were the result of great pressure brought to bear upon the beds in question. Whether these faults and breaks are due to disturbances which took place about the close of the Silurian Age, or at the introduction of the Devonian, when Rigaud and Montreal mountains, and other similar volcanic or intrusive masses, were ejected amidst great perturbation; or whether some of these faults were not in part due to the enormous pressure which the great ice-mass exerted upon the strata in later glacial times are questions which, though readily suggested to one's mind by the phenomena examined, do not find so ready a solution. Having now examined the number, direction, movements, thickness and the erosive power of the glaciers during this Great Ice Age, having very cursorily glanced at the results which were effected in giving to the country the general appearance which it possesses at the present day, there remains to find out what are the materials and under what conditions they were deposited.

The masses of boulders, also termed "boulder clay," "*moraine-profonde*," &c., unlike both the underlying older and overlying newer deposits are not stratified, *i. e.* they have no divisional planes of stratification or true bedding. Pebbles of various sizes and of every kind of rock in the district, usually rounded and smooth, held together or cemented by an argillaceous paste or clay with a certain admixture of arenaceous material derived from the more finely crushed *detritus* and *debris* at the bottom of the glacier, form the lowest division of our Post-Tertiary deposits. These "boulder clays," as they are appropriately termed, have a very large percentage of boulders in them, the

finer material being scanty and in a finely-divided or comminuted state. Such a deposit is one which "land ice" alone produces and one which resembles wonderfully the "moraine-profonde" of the ancient Rhône glacier as they may be seen near the Western extremity of Lake Geneva (a mile and a-half below) and in the adjoining districts. In further corroboration of these boulder clays being due to land ice is the fact that none of the organisms which would be expected to characterize marine clays are present therein. The total absence of organic remains (so far as ascertained) in these glacial clays, coupled with the fact of their occurrence in abundance in the Leda clays above, points clearly to a wide difference in the mode and condition of deposition of both, the one being laid at a great elevation above the sea level, the other below the level of an ocean or arm of a sea.

In examining the surface geology of Ottawa, one is struck with the diversity in the distribution and extent of this "boulder clay formation:" In some places, the only indexes present, which point to its existence at one time, are the striæ and grooves over the bare rocks, such as are exposed principally about Hull and Ottawa in the vicinity of the Grand River, whilst there are also numerous fields and tracts of country which exhibit that formation very clearly. In such post-glacial valleys and districts, from which the Leda clay, and Saxicava sand and overlying strata, have been removed by denudation, there occurs a large quantity of these boulders. Amongst these are no doubt included, at the present day, the erratics which were dropped by ice-bergs at a period subsequent to the Great Ice Age. The Rideau River Valley, of Post-Tertiary Age, and very recent, geologically speaking, presents numerous points of interest from its mouth at the falls in New Edinburgh to the Hog's Back. Nearly the whole of the Post-Tertiary formations were carried away by the once wide stream which flowed there, and even the glacial clays suffered not a little, as the materials cementing the pebbles are to a great extent entirely wanting. The Rideau Rifle Range extends, for the most part, over this formation, whilst the southern portion of the range, as well as its northern limit (at the 600 yard butte) are on the outskirts of the newer overlying marine clays. We have already spoken of *moraines*. These vary very much in extent and distribution just as the "boulder clay" or "till,"

as it is also sometime called, varies from next to nothing to twenty feet or more in thickness in different places. They are extensively developed about Ashburnham Hill, Gilmour's Mills, near the Hog's Back, etc., occupying their lower and regular position at the bottom of the Post-Tertiary series in Upper Town, Centre Town and Stewarton, cropping out in the rear of the City Hall, on the east side of the canal, and ever keeping in a normal position. This "till" is thence very generally distributed in beds of varying thickness, in the area included in a curve drawn from the New Militia Stores on the canal, along Sussex street up to St. Patrick street, then produced on to the bridges over the Rideau river, pretty nearly in a line with the curve which Sussex street there describes, and across to New Edinburgh through the Rideau Hall grounds, to a small extent, where these deposits thin out markedly, and continuing the line through Beechwood, in Gloucester, on in a south-easterly direction, we have a horse-shoe curve, in which are included vast accumulations of material left us by this Ice Period. But to come back to the *moraines*:—there are, besides these hard coherent masses of "boulder clay," large aggregations of more or less uniformly sized boulders held very loosely together, and form a prominent feature of the county. At Gilmour's Mills there is a good example of one of these whilst there has already been pointed out in the "Geology of Canada," 1863—already cited—that a number of zones or belts of boulders cross the Ottawa at different places near the city, one of which a few miles below Ottawa produces a shoal on account of which the navigability of the river at this point becomes dangerous and has obliged the Government to erect a lighthouse. These are what are termed "*morainic belts*," and are prominent features to consider.

There are a number of other particulars respecting which the detailed notes obtained from the excavations that have been carried on in our streets, though bearing immediately on this subject, cannot be included in the present exposition of the subject.

(To be Continued.)

REPORT OF THE BOTANICAL BRANCH.

To the Council of the Ottawa Field-Naturalists' Club:

The same plan of work, found so successful in former years, has been adhered to during the past season with quite satisfactory results. The attendance of botanists at the sub-excursions has been particularly gratifying to the leaders, and there is a decided increase in the amount of individual work being done by members. The Flora of the district is now pretty well worked up and the number of additions to the "Flora Ottawaensis" is smaller than usual. The leaders desire to call the attention of the Council to this list which was prepared by Mr. Fletcher for Part I. of our Transactions, and would suggest that, as most of the plants in the district have probably now been discovered, the time has arrived for a more complete list to be issued, in which all the additions of subsequent years should be included as well as the special localities and the period of inflorescence of each species. We hope that the Council will be able to order such a republication as a supplement to our present Transactions.

We think it well in the interests of the Club to mention the important work done by some of our members in connection with the Colonial and Indian Exhibition, held in London, England, during the past summer. Our worthy President, Prof. Macoun, the Dominion Botanist, spent the whole summer in England, where he was able, by lecturing and in conversation at the Exhibition, to disseminate very valuable information concerning Canada and its natural products. To Mr. James Fletcher, one of the active members of this branch, was entrusted the laying out and arrangement of a Botanical Garden in connection with the Exhibition, where were shown growing specimens of a large number of our Canadian plants. A good representative collection was made of our forest trees, and plants of special interest, whether economic, medicinal or scientific, were shown. In making the collection of roots Mr. Fletcher was materially assisted in his work by several members of the Club, particularly by Mr. H. M. Ami, of this city, and Rev. G. W. Taylor, of Victoria, B.C. It is gratifying to see from the report of the High Commissioner of Canada that this garden

was a decided success, and those who visited the exhibition pronounced it a very interesting feature of the Canadian Exhibit.

We consider it our duty to refer to the valuable work which has been done for the Club by Mr. R. B. Whyte, our senior leader, who, from April to June, gave a systematic course of instruction in Botany to a large class in the Central School West. We believe that in no way will the Club be made more useful and popular than in action similar to this.

Of the plants added to the list during the past season none are of very special interest. New localities for already recorded species have been noted, and add much to our knowledge of the district. *Bidens Beckii*, a plant which seldom flowers freely, this season perfected its flowers in profusion in many of our waters, as Brigham's Creek, Hull, and all along the Rideau River. *Celtis occidentalis*, a tree of rare occurrence here, was observed at Britannia and the Little Chaudiere.

Dipsacus sylvestris, Mill. "The Wild Teazle," although possibly indigenous in Western Canada is not so here, and the specimen collected by Mr. Ami in one of our streets was undoubtedly from seed, accidentally introduced.

Caucalis daucoides, *L.* "Beaked Parsley." One specimen of this plant was found in a wheat field where it had probably been introduced with the seed.

Symplocarpus foetidus, "The Skunk Cabbage," and *Podophyllum peltatum*, L., "The May Apple," were both found by Mr. R. B. Whyte at Perth, Ont., but this is at too great a distance to be included in our local list.

The leaders again express a hope that the study of the Mosses may be taken up with greater enthusiasm by our members. There is no branch of Botany which presents a more fruitful field for research, nor in which there is so little trouble in preparing the specimens.

During the past season Mr. Fletcher has continued his studies in growing from the seed, and cultivating here, plants indigenous to other parts of the Dominion, and has succeeded in flowering the following species in addition to those already mentioned: *Silene Drummondii* (Nor.-West Ter.), *Claytonia perfoliata*, Donn. (Brit. Col.), *Geranium incisum*, Nutt. (B.C.), *Lupinus polyphyllus*, Lindl. (B.C.), *Petalostemon*

candidus, Mx. (N.-W.T.), *Rubus Nutkanus*, Moçino (B.C.), *Liatris cylindracea*, Michx. (W. Ont.), *L. scariosa* (Manitoba), *L. punctata*, Hook. (N.-W.T.), *Soldago rigida*, L. (N.-W.T.), *Gaillardia aristata*, Pursh. (B.C.), *Nemophila parviflora*, Doug. (B.C.), *Phacelia Menziesii*, Torr. (B.C.), *Convolvulus spithamæus*, L. (L. Superior), *Solanum triflorum*, Nutt. (N.-W.T.), *Allium stellatum* (B.C.) The following grow from the bulb and stand our winters well: *Lilium parviflorum*, *Camassia esculenta* and *Fritillaria lanceolata*. All of the above with the exception of the first two and *Solanum triflorum* are worthy of a place in our gardens as ornamental plants.

(Signed)

R. B. WHYTE.
SAML. WOODS.
H. B. SMALL. (M.D.)

ADDITIONS TO THE "FLORA OTTAWAENSIS."

Caucalis daucoides, L. (Stewarton, July).....Mr. Fletcher.
Lonicera oblongifolia, Muhl. (Mer Bleue, July 1)..... do
Dipsacus sylvestris, Mill. (Friel St., Ottawa, July).....Mr. Ami.
Euphorbia Peplus, L. (Green's Creek, September).....Mr. Fletcher
Betula pumila, L. (Mer Bleue, July 1)..... do
Cynosurus cristatus (Stewarton, August)..... do

EXCURSION.

The third regular monthly Excursion was held on Thursday, 21st July, to Buckingham, P.Q. The morning opened dull and cloudy with an occasional drop or two of rain. This dullness, undoubtedly, affected very seriously the attendance, for when the whistle of the "Maude" sounded at 7.20, only 24 members were present. The day turned out a perfect success, the overcast sky during part of the day, accompanied by a light breeze rendered the labours of the Collectors a much pleasanter occupation than has been the case during the greater part of this hot dry month. Rich collections were made in all branches. At noon the party re-assembled for luncheon at the grist

mill over the rapids, after which the Phosphate Crushing Works were visited. The Excursionists received every attention from Mr. Taylor, who, in the absence of the Manager, showed them over the mill and explained the machinery by which the raw material is crushed and prepared for the manufacture of super-phosphate. There were in the mill over 150 tons of ground phosphate (finer than wheat flour) ready for shipment. Having returned to the wharf the usual elementary lectures were delivered by the leaders. Mr. Fletcher was first called upon by the President to speak on Entomology. He stated that rare insects had been collected, and announced the capture of a female of *Colias Interior*, a very rare butterfly, and one he was particularly anxious to breed from the egg. His remarks were directed towards showing the advantages which are to be derived from students working out the life-histories of different species of insects, and showed that it was one of the most important factors in the success of Economic Entomologists.

Mr. Henry M. Ami then explained the different rock-formations which were to be seen in the locality. The Laurentian and Potsdam formations were the two which occurred of the older Geologic Epochs at Buckingham. In the former were found inexhaustible supplies of iron, apatite or phosphate of lime, plumbago, mica, baryta and other mineral products, and the Potsdam formation afforded building materials of first quality. Mr. Ami then drew attention to the traces of glaciation which were well exposed in several places and gave a succinct and lucid account of the Great Ice Age. The President, Mr. R. B. Whyte, gave the address upon the Botanical specimens collected, he said the locality was an exceptionally rich one as was evidenced by the many rarities which had rewarded the collectors. Mr. Whyte took advantage of some of the familiar plants to explain in a clear and attractive manner a few of the rudiments of structural botany. He used the *Nymphæa tuberosa* to show the gradation of all the floral organs ... the leaf-form. *Impatiens fulva*, the common balsam or "Jewel Weed" of our swamps, was exhibited and everyone was advised to take special notice of it, as it was reputed to be the antidote for the Poison Ivy (*Rhus toxicodendron*). Many other rare and beautiful plants were spoken of and made interesting by the remarks of the speaker. The party reached the city again about 9 o'clock, when the

much needed rain, which had kept off during the day, began to fall and continued to do so all night.

SUB-EXCURSIONS.

The Sub-Excursion arranged by the Botanical and Entomological Leaders for the 2nd July had to be postponed on account of wet weather.

SEVENTH.—On the 9th of July, notwithstanding the excessive heat of the day, about fifteen members of the Club, including several ladies, turned up at the usual rendezvous—the General Post Office. At 2 o'clock the party started in the Billings Bridge stage for Dow's swamp. This locality, which lies about two miles south of the city, is one possessing special attractions to the Entomologist and Botanist. The Botanists were under the leadership of the President, Mr. R. B. Whyte, who also delivered the address upon Botany, none of the regular leaders being able to attend upon this occasion. Many plants of interest were collected and their important features were drawn attention to in a pleasing and simple manner, by the President. The magnificent white panicles of the Meadow Rue, *Thalictrum Cornuti*, were conspicuous objects in the cleared spaces of the bog, and beneath the shade of the cedars the rare little orchids, *Microstylis monophyllos* and *M. ophioglossoides*, were found. These treasures only reward the patient searcher or the Botanist with a well-trained eye. Another orchid of interest, but like the last named, possibly more inconspicuous than scarce, was *Liparis Loeselii*, of which a few specimens were secured. In all about forty species of plants were collected in flower. Mr. Fred. Magee represented the Entomologists and exhibited his collections of the afternoon. Dow's Swamp is one of our few localities for the beautiful butterfly *Melitaa Phaeton*, which may still be found in an open glade to the south east of the lake, where it was noted by the late Mr. B. Billings many years ago. Its bright colours, rich velvety black spotted with red and white, make it a conspicuous object as it flits slowly over the low bushes. Its food plant, *Chelone glabra*, grows here in abundance.

EIGHTH.—Rockcliffe was the point decided upon for investigation for the Sub-Excursion of 16th July. The heat was excessive, but over a dozen enthusiastic members turned up. As usual this locality produced much of interest. Here, curiously enough, is the only locality, yet discovered in this neighbourhood for the New Jersey Tea (*Ceanothus Americanus*). Here too occur *Pinus resinosa* and *Woodsia Ilcensis*, both uncommon in the neighbourhood, and on the occasion of the Excursion it was discovered by Mr. A. J. Forward that the rare Ericaceous plant, *Pterospora andromedea*, also grew here. An address was delivered by Mr. Fletcher, leader in Botany and Entomology, upon those subjects. He spoke of the peculiar features of the Flora of the rocky point upon which they stood, and mentioned the plants which had been found. *Pterospora* was probably a parasite upon the roots of pines, the only other place that he knew of, where it could be found about Ottawa, was upon the Chelsea Road. *Comandra*, *Monotropa*, and other parasites were referred to. *Astragalus Canadensis* and *A. Cooperi* were exhibited, and it was shown how they might be known apart. The latter is a much earlier plant, the seed being ripe by the time the former is in flower. The fruit of *Prunus pumila* was exhibited. This shrub is quite rare at Ottawa, one bush only having been previously observed, which grows upon the Chaudiere Islands. In speaking of the insects collected, the different kinds of *Cicada* were described, their "song" was treated of and their life-history was sketched. The different kinds of mosquitoes also formed an interesting topic which was simply explained. Notwithstanding the heat the Sub-Excursion was a great success and the members were well pleased.

ANNOUNCEMENTS.

EXCURSION.—The fourth Excursion will be held on Saturday, 13th August, to Britannia on the Canadian Pacific Railway. The trains leave at 10 a.m. and 12.30 p.m. and the party will return by the 6.45 train in the evening. Return tickets: Members, 25 cents; non-members, 30 cents children, 15 cents.

SUB-EXCURSIONS.—August 6, Gatineau Point; August 20, Beechwood; August 27, Skead's Gravel Road.

THE GREAT ICE AGE AND SUBSEQUENT FORMATIONS AT OTTAWA, ONTARIO.

By H. M. Ami, M.A., F.G.S.

Continued from Page 74.

Following this period of great elevation and of extreme cold there came a period of submergence. Nor must it be surmised that the subsidence which took place in this part of the country was necessarily effected in a short time; on the contrary, it must indeed have taken ages for the country to have come down even to the level at which it is at present—a height of between two and three hundred feet above sea level at Ottawa. As the elevated and ice-bound country was gradually subsiding, there came an amelioration in its climatic condition, and more temperate seasons ensued. The glaciers which at one time discharged their materials into valleys and on land—feeders to a regular system of glacial rivers both in the lowlands and in the mountain districts—now discharged these along the coast, and coast-ice and icebergs were soon at work as the sea was encroaching upon the land and depositing over the old beds of the glaciers a series of sedimentary strata, with which there came also the life and organisms common to such habitats, so that the next period or formation with which we have to deal is one of marine origin, deposited in the still depths of an ocean or sea and containing the remains of animals common to that period in the earth's history. Meanwhile, innumerable quantities of icebergs, carrying with them large blocks of rock and detritus—themselves portions of glaciers—were scattering their burden over the bed of this ocean or sea, as the warmer regions were reached, just as is going on at the present day, along the coasts of Labrador, Newfoundland, etc., the icebergs detached from their northern fortresses sweep down towards the centre of the earth—no doubt to a great extent due to that transporting force developed in the rotation of the earth.

There are certain geologists, I believe, who would account for the striations in the hard rock masses below being formed through the agency of coast-ice and icebergs only. Whilst admitting the possibility of

certain local and limited areas as capable of being affected by the agencies above mentioned, there is little doubt that they are together wholly inadequate to explain the phenomena of striated surfaces (see Prestwich's geology) over such vast areas as it is known that these surfaces extend, in some cases, for hundreds of miles.

But, of the sedimentary strata which, during this period of submergence, were being laid down over the remains of the glacial epoch the lowermost series consists of bluish gray clays of more or less plasticity and varying greatly in thickness in different parts of this region. There are a number of sections both natural and artificial which this district has afforded. Amongst the latter may be mentioned the Rideau Canal, which from the "Basin" to the "Deep Cut" "gives a very good idea of the thickness of these clays there. Then the hundreds of sections which the recent excavations carried on by the City Engineer have exhibited, where in almost every instance, the clays may be seen in their normal position. Then come the brick-yards owned by the Messrs. Odell, Clark, Nicholson, Graham and others. In the first mentioned of these have been found remains of a fossil sponge, the *Tethea Logani* of Dawson, together with shells and *foraminifera* and a bone sent to Prof. Cope for identification, all of which were presented to the writer through Mr. A. P. Low, of the Geological Survey of Canada. But whilst artificial sections are often more convenient in ascertaining the relative thickness of the different kinds of strata, nevertheless, the natural sections which are met with everywhere, enable us to obtain the geographical distributions, extent and thickness, sometimes with greater facility, as these sections are very numerous indeed. Along the left bank of the Rideau River, *e. g.*, from the Hog's Back to the Falls, down the Ottawa as far as Green's Creek, and farther across the river in Hull Township as far as Ironsides, and above that towards New Chelsea, and in Nepean and Gloucester Townships, there are hosts of natural sections, where the "Leda clay" formation—so-called on account of the prevalence of a small bivalve shell, *Leda (Portlandia) arctica*,—Gray is well exposed.

An interesting point about these clays and accompanying strata is the fact that they occur in many instances in the shape of "terraces" or small plateaus following one another at different levels. By one stand-

ing on Parliament Hill some of the more prominent 'terraces' may be clearly seen to the north forming for a considerable distance an almost unbroken line of level, stretching from east to west in the general trend of the Ottawa River. One of these occurs just above Ironsides, as many members of the Club have had occasion to notice, forming a general plateau of clay covered by a thin stratum of sand. These terraces point indubitably to a period of subsequent elevation which was characterized by oscillatory movements i. e. a period of elevation which is not constant, during which periods of quiescence intervene. Such an elevation predicates the next period with which we are to deal; but before entering upon this latter, there are important results which must be noted with regard to the "*Leda clay*" formation. Imbedded within its measures is found a goodly number of interesting organic remains. Nearly all of them are of marine origin and consist in the remains of shells, insects, animals and even plants which will together, when all examined and determined, make not far from thirty distinct species.

With scarcely a single exception all of these species of shells and animals can be dredged up alive now-a-days either in the Gulf of St. Lawrence or along the Coasts of Labrador or Newfoundland, and even as far as Norway. Their mode of preservation is not an uninteresting fact to record, as it is peculiar even in different portions of the same formation. At Green's Creek, for example, on the Lièvre River, and in other localities likewise, both above and below our city, these places are noted for the peculiar nodules which are found included in the clays. By some such process as concretionary action can the agglomeration of finely divided particles of argillaceous rock be best accounted for, principally around some nucleus whatever it may be—a pebble perhaps as in some instances. Remains of the seal, feathers, numerous remains of the caplin *Mallotus villosus* (Cuvier) occur in this manner, whilst it more often happens that the nucleus is so small as to be almost invisible. These nodules have also yielded two other kinds of fish, the Lump Sucker and a Sculpin found by Mr. Stewart recently, all these still live in the Gulf of St. Lawrence. Sir William Dawson has a beautiful collection of these nodules from Green's Creek, from which he has indentified a large number of species of fossil plants, among which are

twigs and bunches of the white cedar which is met with not unfrequently. Another mode of preservation of these fossils at Green's Creek is through the infiltration of a siliceous solution, so that shells are as thoroughly silicified in this deposit as they are in the Black River formation at Paquette's Rapids, muriatic acid not affecting the shell in the least. Others are preserved with but little change from the character in which they were entombed, whilst others appear as if they were live shells with the epidermis on and nicely preserved.

Of the other fossils which characterize this formation a great deal might be said, but passing over these important discoveries I will mention that during the past season a large number of *foraminifera* were collected. Dr. G. M. Dawson, whose extensive researches in Post-Tertiary Geology have enabled him to give valuable information regarding the best mode of obtaining these very minute organisms from the clays, and of working out their microscopic character, has very kindly given the writer such hints as have proved of utmost value in this connection, so that by a series of percolations of a solution of clay and water, on sheets of blotting-paper a large number of specimens was obtained. The largest of these, and a common species in nearly all the collections from the Gulf and elsewhere, is *Polystomella crispa, L.*, which also occurs in our Ottawa deposits. Besides these forms there remains a great deal of material ready to be worked up and awaiting identification.

It has already been hinted that the "Leda clay" formation, laid down beneath the level of an ocean or sea which extended in this region as far west as the Bonnechère River (*loc. cit.*), was followed by a period of elevation. Whilst these clays were thus being deposited along the bottom of the sea, *i.e.*, at some distance from the shores, the sands and gravels which usually mark the littoral deposits of an ocean were being deposited in this vicinity in regular order. They are arenaceous deposits in which distinct lines of stratification occur overlying the clays in numerous localities, but their thickness varies considerably in different places. This uprising of the continent which exposed to view the former depths of the ocean, once begun has continued on, and there is no index that points out whether this elevation has, up to the present day, ceased. The sands and clays which were laid along the shores and bottom of the old Ottawa Sea, up

as far as the Bonnechère River, are now some 500 feet above the mean tide level at Three Rivers, so that there must have been, at least, an elevation of 500 feet in this part of the American Continent in later Post-Tertiary times. Those sands, to which the term "*Saxicava Sand*" has been applied by Sir W. Dawson and others, are very generally distributed over the gravels, clays and older boulder glacial clays in this district. Sandy Hill received its name no doubt on account of the prevelance of this rock about that part of the city, although there is perhaps twenty-five times more clay on Sandy Hill than sand. Near the junction of the sands with the clays below and in places when the the gravels are not coarse, there are found several species of fossils, some of which have already been recorded in the Club's transactions. *Macoma calcarea*, Chemnitz, *M. fragilis*, Fabricius, *Natica affinis*, Gmelin, and others occur in these deposits, but as a rule they are nearly always destitute of fossils. As there must certainly have been many at one time, their remains must have been decomposed and become obliterated. A peculiar seam one inch in thickness occurs near the corner of Waller and Rideau streets, and divides the upper sands into two parts. This bed consists for the most part of leaves of poplar and other trees, bits of grasses and sedges held together, but has been observed to be continuous only for a limited area. There is considerable evidence to show that much of the sands of the district were redeposited in lagoons or lakes along river shores in later times. Overlying the sands in New Edinburgh, on the east side of Hemlock Lake, there occurs a deposit of shell-marl teeming with remains of fresh water and land mollusca, evidently a lacustrine deposit. This bed is now at a considerable elevation above the present lake and river levels.

The upper portion of these sands is that with which we have last to deal, and is included in that period which we call here the Human period, for in it do we find for the first time traces of the existence of human beings. The loam or surface soil, cultivated or not, in which implements of stone are found associated with fragments of pottery, bones of deer, bear, beaver and other animals, points clearly to the fact that man of two distinct types has left his mark in these newer overlying beds. Previous to this, however, no records exist which show, that here in Canada, man came in these

times except subsequent to the Glacial Epoch in the newer and present Historical age.

Nor is the economic aspect of the question, in reference to the use to which the materials which compose the Post-Tertiary deposits of this district can be put, one of trifling importance whether in furnishing useful materials for railroad, commercial, agricultural, or other interests. For ballasting, road metal and the like, the Saxicava Sands, gravels and Boulder Clay formations have been extensively used by the Canada Atlantic and Canadian Pacific Railway authorities throughout this district along their roads at Ottawa and its environs, whilst the sands themselves afford splendid material in the manufacture of mortar for building purposes and to such an extent that a good sand quarry is more remunerative than a gold mine. But whilst these substances are of incalculable value to man, the marine clays of the "Leda Clay" formation supply the brick and tile manufacturers with the material wherewith to turn out these useful building and other requisites and likewise afford an inexhaustible supply of the argillaceous substance necessary in the manufacture of Hydraulic cements, of which the Hull cement of this locality, is well-known to be one of the best slow-setting cements.

Mr. Wright, the manufacturer of the Hull Cement, informs me that the marine clays which he uses are almost equal to the mud or clays dug out of the Thames in England, for the manufacture of the "Portland and Roman Cements," so famous everywhere.

There are many good brick-yards in the vicinity which derive their material from the clays in question, and whilst, it is not deemed necessary to signal out any particular one, nevertheless, that of Mr. T. M. Clarke, of New Edinburgh is worthy of note, as from it, that gentleman turned out a large quantity of white brick of superior quality, by carefully introducing a certain percentage of the white earth taken from the marls overlying the saxicava sands at Hemlock Lake, in McKay's Grove, and submitting it to special process. Brick manufacturing is a most remunerative occupation, especially in such a growing place as Ottawa, where the supply can scarcely equal the demand and the materials are ready and at hand.

The plastic nature of certain strata in the lower portion of the

Leda clays afford good substance for modelling purposes and they have already been used to a certain extent in this direction.

There is a large percentage of *alumina* in these clay deposits, and when we think of the vast advantages which the metal *aluminium* presents over such substances as iron, copper, lead and zinc, it may not be amiss to look forward to the time when a process shall be discovered which will enable its being manufactured from clays such as we have at our very doors. Nay, if I am rightly informed, a series of very successful experiments have been carried on by French chemists and others of late by means of which that metal can be produced, but at a cost which, at the present time, is too great so that this aluminium industry cannot compete with that of iron. Those who are familiar with the properties of this metal will clearly see what advantages the community would reap if a aluminium could be manufactured cheaply and from the clays which are so abundantly distributed with us.

And to sum up the results thus obtained in the examination of the Post-Tertiary deposits of Ottawa and vicinity, an ideal vertical section, made to include the various measures which compose them is here given :—It is based on an actual section taken in the excavations along Waller street, not far from Rideau street and is supplemented by data obtained from other quarters. The lowest measures are those which belong to the "Boulder or Glacial Clay" or "till" formation and are seen to rest on the Cambro-Silurian formations of the district unconformably. Their thickness is considerable in numerous places but varies materially, according to the district in which they occur. The "Leda Clay" formation overlies this glacial deposit and contains fossils of various kinds entombed in strata. The thickness of this marine deposit is considerable in some places whilst it has been completely eroded or denuded in others at a remote, but subsequent period to its deposition. The clays often carry erratics with them. Then comes a series of stratified gravels or coarse sands in which many large angular and partially rounded boulders occur overlying the Leda Clays, in most cases apparently conformably, but oftimes, no doubt, unconformably as the line of contact is very sinuous and points to a good portion of the clay as having been carried away. Overlying these gravels are

found the yellow and darker sands so extensively developed about Ottawa. The shell-marl deposit overlies these sands, and along with them form the newest or topmost deposits of our district. It is in these most recently deposited strata that the Human remains occur—remains which point to the time when this part of Canada was first inhabited by Algonquin tribes who flourished at one time, leaving behind them innumerable traces of the advanced state of civilization to which they had attained whether in hunting or other practices of life common to their race. But these newer and arenaceous strata deposited on the shore or margin of an ocean or sea, point clearly to a period of elevation, which period has been going on ever since, so that this part of the American Continent may safely be said to be rising yet, at least in Eastern Canada, and until we have actual proofs of a submergence going on, a depression along the coast or an encroachment of tidal and other oceanic phenomena on the land, we may rest safely with the happy thought that we are on the upward move.

LIBRARIAN'S RECORD.

The following publications have been received as donations, or in exchange for the transactions of the Club:—

W. D. Dimock, B. A. Truro: Catalogue of Exhibits from New South Wales at Colonial Exhibition; Victoria Year Book, 1884-85; Illustrated Hand Book of Victoria; Hand Book of New Zealand, 1886; Facts and Figures relating to the Bendigo Gold Field, Victoria; The Indigenous Vegetation of Australia, &c.; Observations on New Vegetable Fossils of the Auriferous Drifts, Victoria; Catalogue of Exhibits of the Victorian Court.

W. A. Kellerman, Ph. D.: Journal of Mycology, Vol. III, Nos. 4 to 8.

Montreal Natural History Society: Canadian Record of Science, Vol. II, Nos. 6 and 7.

Johns Hopkins University: Circular, Nos. 57, 58 and 59.

Elisha Mitchell Scientific Society: Journal, 1883-84, 1884-85, 1885-86; Memories of Rev. Elisha Mitchell.

Liverpool Naturalists' Field Club: Proceedings, 1885-86.

Nova Scotia Natural History Society: Proceedings, Vol. VI, Part 9

Rev. Dr. Honeyman, D.C.L.: Giants and Pigmies.

United States Geological Survey: Dinocerata, a Monograph of an Extinct Order of Gigantic Mammalia, by Prof. O. C. Marsh.

Miss E. A. Ormerod: Transactions of the Entomological Society of London, 1887; The Garner and Scientific Recorder's Journal, eight numbers; Manuel of Injurious Insects; The Hessian Fly; Lecture on Injurious Insects; Lecture on the Turnip Fly; Observations on Œstridæ, or "Botflies"; Reports on Injurious Insects for 1877, 1879, 1882-3-4-5-6 and other papers; Guide to the Methods of Insect Life.

Massachusetts Horticultural Society: Annual Report, 1886, Part II.

The Editor: Ornithologist and Oologist, Vol. XII, No. 6.

American Museum of Natural History: Annual Report, 1886-87; Bulletin, Vol. XII, No. 1.

American Ornithologists' Union: The Auk, Vol. IV, No. 3.

Cincinnati Society of Natural Nistory: Journal, Vol. X, No. 2.

Torrey Botanical Club: Bulletin, Vol. XIV, Nos. 6, 7, 8.

Essex Field Club: The Essex Naturalist, Nos. 5, 6.

New Brunswick Natural History Society: Bulletin, No. 4.

Brooklyn Entomological Society: Entomologica Americana, Vol. III, Nos. 3, 4, 5.

Ontario Entomological Society: Canadian Entomologist, Vol. XIX, Nos. 6, 7, 8; Annual Report, No. 17.

A. C. Lawson, M. A.: Geology of the Rainy Lake Region.

Department of Agriculture, Manitoba: Crop Bulletin, Nos. 18-20.

Queen's University, Kingston: Calendar, 1887-88.

New York Microscopical Society: Journal, Vol. III, Nos. 1, 2.

Guelph Scientific Society: Proceedings, 1886-87.

Illinois State Laboratory: Vol. II, Articles 5, 6; Vol. III, Article 1.

SUB-EXCURSIONS.

NINTH.—On 30th July this Excursion was to have been to the Beaver Meadow, Hull; but as only five members of the botanical section turned up, and the heat was intense, it was decided to visit a nearer locality, and Stewart's Bush was chosen. The woods, owing to the almost unprecedented drought, were very dry, and it was noticed that the underbrush and even the forest trees were suffering severely from want of water.

TENTH.—On 6th August to Gatineau Point, P.Q. This Excursion was a very successful one. Several ladies attended the meeting and made collections of plants under the guidance of the President, Mr. Whyte, and the botanical leader, Mr. Fletcher. The different character of the soil and woods in the vicinity of Gatineau Point, as compared with more accessible localities on the Ontario side of the river, always renders it an interesting field for our collectors. While the woods and fields were being ransacked by the botanist and entomologist Mr. Latchford, the conchologist, accompanied by one brave and enthusiastic lady follower, took a somewhat dangerous and will-o-the-wisp-like journey over the surface of a dried up creek. Mr. Latchford reported, however, that no finds of special interest had rewarded their efforts. The party assembled in a maple grove, where some of the beauties and wonders of plant and insect life were elucidated by Mr. Fletcher. He spoke of some of the plants which are useful to man; hemp, nettle, milkweed and fireweed (epilobium) were referred to as fibre plants. Some of the peculiarities of the *Solanaceæ* were explained and the action of frost upon potatoes and other vegetation was spoken of. The life history of *Limenitis Disippus* was told and some interesting instances of protective mimicry and hibernation amongst insects were related.

ELEVENTH.—On the 27th August a botanical party visited the Beavor Meadow, Hull, and spent a very pleasant afternoon in that interesting locality. The President, Mr. R. B. Whyte, made an instructive address on the more noteworthy species collected, among which may be mentioned the Pickerel weed, the closed Gentian, and the Clematis (*C. Virginiana*, L.) of which the fruit is very interesting.

EXCURSION TO BRITANNIA.

The fourth general Excursion was held on Saturday, the 13th August, to Britannia, where a most agreeable afternoon was spent. There were present some thirty members and their friends, but unfortunately several others arrived at the station a few moments too late, and were deprived of their outing. On arriving at the Britannia station the party separated, some going with Mr. Ami to examine the rock formations, and the remainder accompanying the botanical and entomological leaders. The woods and fields in the neighborhood of the light house, track and gravel pit were carefully explored, and many finds of importance were made. At six o'clock the party re-assembled at the station and listened to addresses from the leaders until the arrival of the train for Ottawa. Mr. Fletcher spoke of the plants and insects observed, and Mr. Ami of the geological formations.

ANNOUNCEMENTS.

Excursion.—The Fifth General Excursion of the season will be held on Saturday, the 17th September, to Kirk's Ferry. This point is about four miles above Chelsea, upon the Gatineau River, and is a very picturesque and attractive place, which has not yet been visited by the Club. The trip will be made in vans, and there being a good road all the way, the time taken will be less than that required to visit Kingsmere or Meach's Lake. Tickets can be obtained from any member of the Council at the following rates: Members 40 cents; Non-members 50 cents; Children 25 cents. The vans will start from the corner of Rideau and Chapel streets at 8.45 a.m., and from the corner of Sparks and Bank streets at 9 a.m.

Sub-Excursions.—Botanical outings will be held each Saturday afternoon (except on date of general excursion), starting as usual from the Post Office at 2 p.m. Visits will be made to Hull, Billings' Bridge and Beechwood.

REPORT OF THE GEOLOGICAL BRANCH.

To the Council of the Ottawa Field Naturalists Club.

The leaders have much pleasure in reporting that continued progress in the development of the geological and kindred resources of this rich and interesting field of research has marked the season just passed. Mr. John Stewart, whose energy and zeal have been rewarded by the accumulation of very extensive and valuable collections of fossils from the splendid exposures of Ottawa and its environs, reports that during the past year he has made a large number of very interesting finds in the various formations of this district. Besides making an elaborate collection of the species represented in the Hudson River formation outlier on the Canada Atlantic Railway some four miles distant from the city and collecting also in the Utica Formation immediately underlying this along the Rideau River, Mr. Stewart has discovered a number of rare and even new species in the Trenton rocks, from which he has made an especially valuable collection, comprising beautiful crinoids and cystideans, for which this locality is already so famous in palæontological circles. Besides these he has also made an extensive collection of the species associated in the same formation, most of which are readily identified as Prof. Hall's or Mr. Billings' species and are to be found in the various lists of fossils published by the Club. Detailed notes on these will, we hope, be soon forthcoming from the pen of Mr. Stewart whose activity in connection with the interests of geology, and palæontology more particularly, has been marked, ever since his arrival in Ottawa when he joined the Club. Nor have the old palæozoics of Ottawa been the only rocks examined by him; his field of research has extended to, and has included, the Post-Tertiary deposits of Green's Creek in Gloucester—a locality often cited for interesting material—one which has been made famous by the pen of Sir William Dawson and others. A very interesting specimen of a fish, rarely met with in these deposits, was found by him and is most probably referable to a form ascribed to the genus Cottus in the "Geology of Canada" 1863, p. 917, and which at the present day lives in the Gulf of St. Lawrence and along the Western Atlantic coast. Besides this interesting fish Mr. Stewart has also collected remains of plants and shells

characteristic of the above deposit which afford a great deal of promising material for examination.

Mr. Stewart having reported from the Trenton Rocks of Belleville, Ont. (a locality outside of the Club's radius), *Cyrtolites compressus, Conrad*, for the first time recorded in Canada; Mr. Ami was led to re-examine a form collected by him on the Castor River (*vide* Trans., O.F.N.C., Vol. II, No. 2, p. 257, 1884-85) on the occasion of a sub-excursion of the Geological Branch, and found it to be the same species. At the latter locality it was found associated with *Bucania bidorsata*, Hall, *Bellerophon bilobatus*, Sowerby, and other characteristic species of the Trenton formation.

Mr. Sowter reports that during the past year he has examined a number of fossiliferous localities on both the Ontario and Quebec shores of Lake Des Chenes, in the Chazy and overlying Black River formations, but more particularly in the latter. From these he has obtained a fine suite of fossils which he intends shall form the subject matter for a communication or note to be presented at a subsequent Soirée of the Club, and which promises to be a valuable contribution, including as his collections do some rare, choice and, no doubt, unrecorded species from that district.

Mr. Henry M. Ami reports that during the past season he was present at *three* out of the *four* general excursions which were held under the auspices of the Club, and on which occasions he acted as leader in geology, besides conducting a number of successful sub-excursions, especially in the latter part of the season—the most favourable for such work. These excursions and sub-excursions were held to various objective points in and about the city, so that nearly all the formations comprised in the Ottawa series were visited and examined—from the Laurentian, so beautifully developed in the hills to the north—to the Post-Tertiary deposits overlying all the intermediate formations included. From these, a number of interesting facts were ascertained and noted respecting the geologic structure of their measures and the organic remains contained in them, whether from the Potsdam, Calciferous, Chazy, Black River, Trenton, Utica or Hudson River, as well as from the fossiliferous Post-Tertiary clays and sands.

Post-Tertiary.—Beginning with these newer deposits, Mr. Ami reports that on account of the numerous excavations for sewers, etc., he has been enabled to obtain a number of interesting sections of the strata from the boulder clay and glacial drift deposits up to the recent overlying sediments. The results thus obtained from various parts of our city, will be embodied in a communication (now in course of preparation) shortly to be presented to the Club entitled: "The Great Ice Age and Subsequent Formations at Ottawa."

Hudson River Formation.— A special visit was paid to the exposures of this formation in October last and a number of interesting forms were found. The collection yielded a number of species new to the list already published in the Transactions of the Club (Trans. O. F. N. C., Vol. II, No. 2, page 258). These were: *Pterinea demissa*, Conrad, an eminently characteristic species; *Strophomena* (*Streptorhynchus*) *subtenta*, Conrad; *Platystrophia lynx*, Eichwald (*Platystrophia bifoviata*, Schlotheim, *var*, *lynx*, Eichwald and *Orthis lynx*, Eichwald, of authors); *Leptæna sericea*, Sowerby (very abundant); *Calymene senaria*, Conrad; a *Pleurotomaria*, allied to *subconica*, Hall; a trilobite referred provisionally to the genus *Remopleurides*, besides portions of Monticuliporoid corals—each of which last three mentioned require further study. The opening which was made in the field to the north of the Canada Atlantic Railway track some three and three-quarter miles from the city has afforded a good many specimens. The beds are light brown or buff weathering, and consist of a fine grained calcareo-argillaceous dolomitic paste with some arenaceous material in a finely divided state. The fossils which they contain are tolerably well preserved and abundant—and whilst only some fifteen species have as yet been observed in this formation from that locality there is no doubt that future investigations will increase that number considerably.

Utica Formation.—Most of the attention devoted to this formation has been in the direction of ascertaining what were the species associated in the same band of impure limestone with *Siphonotreta Scotica*, Davidson. Several sub-excursions were held to the locality (mentioned in the Report of Geological Branch, in the transactions of the Club for 1885-86) opposite the Rifle Range on the Rideau River in Gloucester, and no less than sixteen species have already been found in

the same bed. In his "Notes on, and the precise geological position of *Siphonotreta Scotica*, Davidson," presented and read at the meeting of the Club—February 10th, 1887—Mr. Ami mentioned these species, and the facts obtained were therein recorded. Besides the above a species of graptolites, obtained from the Utica has been placed at the disposal of Mr. Whiteaves, of the Survey, who has had them forwarded to Prof. Lapworth of Mason Science College, Birmingham, the best authority on these interesting fossils, for examination.

The following species are new to the lists already published from the Utica:—

Orthis emacerata, Meek.

Leperditia minutissima, Hall.

Beyrichia oculifera, Hall.

Trenton Formation.—In this formation which is ever teeming with abundance of fine material, a number of good finds were made which require more study before publishing the notes on them. In this connection it may not be deemed out of place to mention the fact that Prof. E. O. Ulrich, of Cincinnati, Ohio, who on several occasions has generously lent his assistance in determining critical species of Polyzoa from our rocks, was in Ottawa during the past summer and made an extensive collection at the Brigham quarries at Hull and in other parts of the Trenton here, so that when all the Polyzoa which he collected are worked up the number of species from that remarkable group of organisms will be considerably increased.

Potsdam Formation.—The exposures of this formation were visited by the Club during the past summer at a general excursion to Buckingham, Que., where, besides collecting a fine series of the typical *Scolithus Canadensis*. Billings—a number of previously unrecorded facts were obtained on the evidence of glaciation on the quartzites or sandstones of this formation. These sandstones, a bluff of which faces the Laurentian rocks in the immediate vicinity to the north, are seen to be deeply grooved, striated and polished. Of the annelid (?) remains referable to the genus Scolithus, Billings Species, *S. Canadensis*, was by far the commoner form met, but two very good examples of *S. linearis*, Hall, were found associated with it. From the notes which Mr. Ami has made on the subject he is strongly of the opinion that the

main difference existing between these two species lies principally in the preservation, *S. Canadensis* B, occurring as hollow tubes or burrows, whilst Hall's species is found as casts of the interior of the burrow or hole. In comparing the form *S. linearis*, Hall with the species recorded from the Potsdam formation of L'anse au Loup, Que. (See Pol. Foss. Billings, Vol. 1, P. 2), they are found to be exactly similar and cannot be differentiated.

In conclusion, the leaders are happy to state that there is a vast field of labour before this Branch of the Club, and it is therefore encouraging to note the good work which many members of the Club have performed. It is hoped that the time is not far distant when a good topographical map will exist upon which it will be possible to lay down the geological features of the district in a more or less detailed manner. What is more important at present is to obtain from the excavations being made in all parts of the city the sections which such excavations afford and collect all the fossil evidence possible, whether in the later or earlier formations of this locality, as both are very fossiliferous and problems of vast import relating to the geology of other parts of Canada, problems as yet unsolved, will be materially helped thereby.

To this end, each member can contribute his or her share towards the gathering of material wherewith to frame at some future time a systematic and comprehensive *résumé* of the geology of Ottawa. In doing so, the members will not only contribute to this, but will materially assist the Council and help the leaders in furthering the work of the Club.

HENRY M. AMI,
T. E. W. SOWTER, } *Leaders.*

Ottawa, January 25th, 1887.

REPORT OF THE ORNITHOLOGICAL BRANCH FOR THE YEAR 1886-87.

To the Council of the Ottawa Field-Naturalists' Club :—

In making up the Report of the proceedings and researches of this branch during the past season the leaders are able to report three additions to the already large list of birds found in this locality. The first was the finding of the Buff-breasted Sandpiper, *Tryngites subruficollis*, a remarkably interesting little bird with a peculiar aspect. It can at once be recognized by the very small and short bill, and by the unique coloration of the primaries, which are gray or white on the inner webs and beautifully mottled with fine black tracery. Two specimens were shot and six were seen.

The second addition was a fine specimen of the Red Phalarope, *Chrymophilus fulicarius*. This is an important addition as it is particularly a maritime bird and the finding of this bird following so soon after the discovery of the Purple Sandpiper and the Great Black-backed Gull found last year would lead one to suppose that some of the coast birds are in the habit of following the Ottawa and Rideau Rivers on their way south. To the former we have to add the Blue Goose, *Chen caerulescens*. Three fine specimens were shot within a few miles of the city, two geese and a gander. The peculiar marking of the bill and feet of these specimens are worthy of special mention. Dr. E. Coues in his valuable work states that the bill and feet are lake red, whereas those shot have the bill and feet black. The markings, however, agree in every other particular with Dr. Coues' description and there can be no question as to the specimens taken being Blue Geese. The capture of a pair of the very pretty, but rather scarce Mourning Warbler, is very encouraging. We have also been informed of the shooting of two specimens of the Shoveller Duck, by Mr. W. P. Lett ; one at Richmond and the other at Brigham's Creek. This species is very scarce in this district, only some half dozen specimens being reported as having been killed in the vicinity of Ottawa. We have also to report the capture of a female Yellow-bellied Sapsucker, shot on 17th April, 1886, with the top of the head blue-black instead of scarlet. Appended is a list of the dates of arrival and departure of our summer birds.

March 3—*Octocorus alpestris*, Horned Lark.
" 13—*Carpodacus purpureus*, Purple Finch.
" 26—*Merula migratoria*, Robin.
" 26—*Junco hyemalis*, Slate-coloured Junco.
" 27—*Spinus tristis*, American Goldfinch.
" 27—*Loxia curvirostra minor*, American Crossbill.
" 27—*Dryobates pubescens*, Downy Woodpecker.
" 28—*Lanius borealis*, Northern Shrike.
" 29—*Melospiza fasciata*, Song Sparrow.
" 30—*Falco columbarius*, Pigeon Hawk.
" 31—*Quiscalus quiscula*, Purple Grackle.
" 31—*Molothrus ater*, Cowbird.
" 31—*Agelæus phœniceus*, Red-winged Blackbird.
" 31—*Sialia sialis*, Bluebird.
" 31—*Corvus americanus*, Crow.
April 5—*Tachycineta bicolor*, Tree Swallow.
" 6—*Glaucionetta clangula americana*, American Golden-eye.
" 9—*Sturnella magna*, Meadow Lark.
" 11—*Ardea herodias*, Great Blue Heron.
" 11—*Sayornis phœbe*, Phœbe.
" 12—*Lophodytes cucullatus*, Hooded Merganser.
" 12—*Ammodramus sandwichensis savana*, Savanna Sparrow.
" 12—*Poocœtes gramineus*, Vesper Sparrow.
" 12—*Spizella monticola*, Tree Sparrow.
" 12—*Scolecophagus carolinus*, Rusty Blackbird.
" 13—*Progne subis*, Purple Martin.
" 14—*Spinus tristis*, American Goldfinch (summer plumage).
" 15—*Larus argentatus smithsonianus*, Herring Gull.
" 15—*Ectopistes migratorius*, Passenger Pigeon.
" 15—*Regulus satrapa*, Golden-crowned Kinglet.
" 16—*Spizella socialis*, Chipping Sparrow.
" 16—*Regulus calendula*, Ruby-crowned Wren.
" 16—*Zonotrichia leucophrys*, White-crowned Sparrow.
" 17—*Colaptes auratus*, Flicker.
" 17—*Zonotrichia albicollis*, White-throated Sparrow.
" 17—*Ceryle alcyon*, Belted Kingfisher.

April 17—*Sphyrapicus varius*, Yellow-bellied Sapsucker.
" 19—*Passerella iliaca*, Fox Sparrow.
" 19—*Lanius borealis*, Northern Shrike.
" 20—*Empidonax minimus*, Least Flycatcher.
" 21—*Turdus aonalaschkae pallasii*, Hermit Thrush.
" 21—*Loxia curvirostra minor*, American Crossbill.
" 23—*Anas obscura*, Black Duck.
" 23—*Actitis macularius*, Spotted Sandpiper.
" 23—*Falco sparverius*, American Sparrow Hawk.
" 23—*Charitonetta albeola*, Buffle-head.
" 24—*Gallinago delicata*, Wilson's Snipe.
" 26—*Philohela minor*, American Woodcock.
" 26—*Anas carolinensis*, Green-winged Teal.
" 26—*Totanus melanoleucus*, Greater Yellow-legs.
" 27—*Aix sponsa*, Wood Duck.
" 27—*Branta canadensis*, Canada Goose.
" 28—*Botaurus lentiginosus*, American Bittern.
" 29—*Pandion haliaetus carolinensis*, American Osprey.
" 30—*Nycticorax nycticorax nævius*, Black-crowned Night Heron.
" 30—*Podilymbus podiceps*, Pied-billed Grebe.
" 30—*Dafila acuta*, Pintail.
May 1—*Circus hudsonius*, Marsh Hawk.
" 1—*Clangula hyemalis*, Old Squaw.
" 2—*Melanerpes erythrocephalus*, Red-headed Woodpecker.
" 4—*Dendroica coronata*, Myrtle Warbler.
" 5—*Ampelis cedrorum*, Cedar Waxwing.
" 5—*Vireo olivaceus*, Red-eyed Vireo.
" 5—*Chætura pelasgica*, Chimney Swift.
" 6—*Dendroica æstiva*, Yellow Warbler.
" 6—*Icterus galbula*, Baltimore Oriole.
" 6—*Troglodytes aedon*, House Wren.
" 6—*Urinator imber*, Loon.
" 6—*Colymbus auritus*, Horned Grebe.
" 7—*Trochilus colubris*, Ruby-throated Hummingbird.
" 8—*Setophaga ruticilla*, American Redstart.

May 8—*Habia ludoviciana*, Rose-breasted Grosbeak.
" 8—*Mniotilta varia*, Black and White Warbler.
" 8—*Buteo latissimus*, Broad-winged Hawk.
" 9—*Tyrannus tyrannus*, Kingbird.
" 11—*Dendroica cærulescens*, Black-throated Blue Warbler.
" 11—*Dendroica maculosa*, Magnolia Warbler.
" 11—*Dendroica blackburniæ*, Blackburnian Warbler.
" 11—*Dendroica pensylvanica*, Chestnut-sided Warbler.
" 11—*Dendroica castanea*, Bay-breasted Warbler.
" 11—*Compsothlypis americana*, Parula Warbler.
" 11—*Seirus aurocapillus*, Oven-bird.
" 11—*Vireo solitarius*, Blue-headed Vireo.
" 12—*Harporhynchus rufus*, Brown Thrasher.
" 12—*Dolichonyx oryzivorus*, Bobolink.
" 12—*Dendroica virens*, Black-throated Green Warbler.
" 12—*Sylvania canadensis*, Canadian Warbler.
" 12—*Galeoscoptes carolinensis*, Catbird.
" 12—*Vireo philadelphicus*, Philadelphia Warbler.
" 12—*Antrostomus vociferus*, Whip-poor-will.
" 13—*Turdus ustulatus swainsonii*, Olive-back Thrush.
" 13—*Myiarchus crinitus*, Crested Fly-catcher.
" 13—*Dendroica tigrina*, Cape May Warbler.
" 13—*Helminthophila perigrina*, Tennessee Warbler.
" 13—*Helminthophila ruficapilla*, Nashville Warbler.
" 14—*Piranga erythromelas*, Scarlet Tanager.
" 14—*Clivicola riparia*, Bank Swallow.
" 14—*Petrochelidon lunifrons*, Cliff Swallow.
" 14—*Ceophlœus pileatus*, Pileated Woodpecker.
" 17—*Vireo gilvus*, Warbling Vireo.
" 17—*Chordeiles virginianus*, Night Hawk.
" 18—*Sylvania pusilla*, Wilson's Warbler.
" 18—*Totanus solitarius*, Solitary Sandpiper.
" 19—*Turdus mustelinus*, Wood Thrush.
" 19—*Oidemia perspicillata*, Surf Scoter.
" 21—*Turdus fuscescens*, Wilson's Thrush.
" 21—*Archibuteo lagopus sancti-johannis*, American Rough-legged Hawk.

May 22—*Ægialitis semipalmata*, Semipalmated Plover.
" 24—*Coccyzus erythrophthalmus*, Black-billed Cuckoo.
" 27—*Dendroica striata*, Black-poll Warbler.
" 28—*Porzana carolina*, Sora.
" 28—*Rallus virginianus*, Virginia Rail.
" 29—*Geothlypis philadelphia*, Mourning Warbler.
June 18—*Loxia curvirostra minor*, American Crossbill.
July 14—*Geothlypis trichas*, Maryland Yellow-throat.
" 29—*Larus philadelphia*, Bonaparte's Gull.
August 3—*Passerina cyanea*, Indigo Bunting.
" 5—*Loxia curvirostra minor*, American Crossbill.
" 24—*Calidris arenaria*, Sanderling.
" 24—*Erennetes pusillus*, Semipalmated Sandpiper.
" 24—*Totanus flavipes*, Yellow-legs.
" 24—*Totanus melanoleucus*, Greater Yellow-legs.
" 24—*Ægialitis semipalmata*, Semipalmated Plover.
" 24—*Tryngites subruficollis*, Buff-breasted Sandpiper.
" 24—*Tringa minutilla*, Least Sandpiper.
" 27—*Tryngites subruficollis*, Buff-breasted Sandpiper.
" 29—*Seiurus aurocapillus*, Oven-bird.
" 30—*Ampelis cedrorum*, Cedar Waxwing.
" 30—*Vireo olivaceus*, Red-eyed Vireo.
" 30—*Sylvania pusilla*, Wilson's Warbler.
Sept. 2—*Progne subis*, Purple Martin.
" 2—*Petrochelidon lunifrons*, Cliff Swallow.
" 3—*Setophaga ruticilla*, American Redstart.
" 4—*Tachycineta bicolor*, Tree Swallow.
" 4—*Helminthophila ruficapilla*, Nashville Warbler.
" 4—*Dendroica striata*, Black-poll Warbler.
" 9—*Scolecophagus carolinus*, Rusty Blackbird.
" 10—*Haliæetus leucocephalus*, Bald Eagle.
" 10—*Charadrius squatarola*, Black-bellied Plover.
" 10—*Pandion haliaetus carolinensis*, American Osprey.
" 10—*Myiarchus crinitus*, Crested Flycatcher.
" 14—*Spatula clypeata*, Shoveller.
" 14—*Turdus aonalaschkae pallasii*, Hermit Thrush.

Sept. 14—*Sayornis phœbe*, Phœbe.
" 14—*Trochilus colubris*, Ruby-throated Hummingbird.
" 16—*Falco columbarius*, Pigeon Hawk.
" 16—*Spizella socialis*, Chipping Sparrow.
" 16—*Sitta canadensis*, Red-breasted Nuthatch.
" 17—*Myiarchus crinitus*, Crested Flycatcher.
" 18—*Cyanocitta cristata*, Blue Jay.
" 18—*Chelidon erythrogaster*, Barn Swallow.
" 20—*Ceryle alcyon*, Belted Kingfisher.
" 20—*Poocœtes gramineus*, Vesper Sparrow.
" 20—*Scolecophagus carolinus*, Rusty Blackbird.
" 20—*Compsothlypis americana*, Parula Warbler.
" 20—*Tringa maculata*, Pectoral Sandpiper.
Oct. 2—*Colaptes auratus*, Flicker.
" 5—*Branta canadensis*, Canada Goose.
" 5—*Accipiter velox*, Sharp-shinned Hawk.
" 6—*Ammodramus sandwichensis savana*, Savanna Sparrow.
" 6—*Tringa alpina*, Dunlin.
" 6—*Tringa minutilla*, Least Sandpiper.
" 8—*Zonotrichia leucophrys*, White-crowned Sparrow.
" 8—*Zonotrichia albicollis*, White-throated Sparrow.
" 8—*Spizella socialis*, Chipping Sparrow.
" 8—*Regulus satrapa*, Golden-crested Kinglet.
" 8—*Regulus calendula*, Ruby-crowned Kinglet.
" 9—*Falco sparverius*, American Sparrow Hawk.
" 11—*Passerella iliaca*, Fox Sparrow.
" 11—*Chen cœrulescens*, Blue Goose.
" 16—*Tringa fuscicollis*, White-rumped Sandpiper.
" 16—*Lanius borealis*, Northern Shrike.
" 19—*Melospiza fasciata*, Song Sparrow.
" 21—*Crymophilus fulicarius*, Red Phalarope.
" 23—*Spizella monticola*, Tree Sparrow.
" 23—*Sturnella magna*, Meadow Lark.
" 23—*Actitis macularia*, Spotted Sandpiper.
" 23—*Gallinago delicata*, Wilson's Snipe.
" 23—*Dendroica coronata*, Myrtle Warbler.

Oct. 23—*Sialia sialis*, Bluebird.
" 23—*Junco hyemalis*, Slate-coloured Junco.
" 30—*Gallinago delicata*, Wilson's Snipe.
Nov. 1—*Ceophlœus pileatus*, Pileated Woodpecker.
" 5—*Clangula hyemalis*, Old-squaw.
" 18—*Merganser americanus*, American Merganser.
" 18—*Sitta carolinensis*, White-breasted Nuthatch.
" 19—*Plectrophenax nivalis*, Snowflake.
" 19—*Pinicola enucleator*, Pine Grosbeak.
" 22—*Accipiter atricapillus*, American Goshawk.
" 23—*Accipiter velox*, Sharp-shinned Hawk.
" 25—*Surnia ulula*, Hawk Owl.

GEO. R WHITE, } *Leaders.*
J. M. MACOUN, }

10th March, 1887.

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ANNOUNCEMENTS.

The Soiree Committee is arranging a programme for the winter meetings, and requests contributions of papers or notes from the members; titles to be communicated with as little delay as possible, so that the programme may appear in the next number of the Ottawa Naturalist.

NOTE ON OTTAWA SALAMANDERS.

F. R. Latchford, B.A.

(*Read 27th January, 1887.*)

Vertebrate animals are usually arranged by naturalists in five classes—mammals, birds, reptiles, amphibians and fishes. To the fourth of these divisions the salamanders belong. They have the general form of lizards, an elongated body, four feet, and a long tail; but their body is naked and not covered with scales, and their heart, like that of the frogs, has but one auricle, while the heart of the lizards and other true reptiles has two. While many species of salamanders, after becoming adult, never resort to the water except to deposit their eggs, all pass there the earlier stages of their existence and there undergo a series of remarkable changes of form. It was formerly a widely prevalent opinion that the salamanders were very poisonous; and in ancient natural history many astonishing instances are recorded of their poisonous qualities and of their powers to withstand the action of fire. They are, however, almost, if not quite, innocuous. The stories related of their appearance in the midst of blazing logs in fire-places and their escape unharmed through the flames are not without foundation in fact. Several species live buried deep in decaying wood, and should a log containing them be placed on the hearth and lighted, they naturally endeavour to make their way to cooler quarters—the abundant viscid fluid which they secrete all over their body enabling them to resist fire to a considerable extent and in many instances to make good their escape.

Six species have been noticed in the vicinity of Ottawa. The Spotted Salamander (*Amblystoma punctatum*, Linn) is the largest species found in this vicinity where it is not uncommon. I have taken it on the McKay Estate, on the Canal Bank near Dow's Lake and in the Laurentides at Cantley. It usually attains a length of six inches, and I have one specimen which measures eight. Its colour above is a dark violet with numerous irregular bright yellow spots. Barton, who was the first in America to describe this species, called it the Poisonous Salamander (*S. venenosa*), but it is quite as harmless as other species.

Jefferson's Salamander (*Amblystoma jeffersonianum*, Baird) is nearly as large as *A. punctatum*, and like that species is terrestrial in its habit. It is brown in colour and is irregularly marked along the sides and on the back with numerous small bluish spots. Specimens have been taken in Hull by Mr. Harrington and by Mr. John Stewart.

The Red-backed Salamander (*Plethodon erythronotus*, Baird) is found in considerable numbers in rotten logs in the woods west of Hemlock Lake. The intensity of the colouring of the reddish lines along the back from which it takes its name varies greatly. The body is very slender and the legs are apparently weak, but the animal is notwithstanding able to move quite rapidly.

At Kingsmere, in May, 1884, a Two-lined Salamander (*Spelerpes bilineatus*, Baird) was captured by Mr. D'Arcy Scott. I have not seen the specimen; but it was identified by Dr. Merriam and no doubt correctly. It is a small, yellow species with dark lateral lines.

The Spotted Triton (*Diemyctylus viridescens*, Raf.) was found by Mr. Harrington, at Casselman, in 1884. It has not to my knowledge been found nearer Ottawa, but probably occurs here. It is a brightly coloured species, usually reddish above, with a row of bright and rather large vermilion spots along each side.

The dusky Salamander (*Desmognathus fuscus*, Baird) is a small, brownish species which occurs in great numbers in the Rideau River, near Hogsback, where a stone a few inches in diameter will be found to cover three or four individuals. When disturbed they seek shelter with incredible rapidity, and very easily escape capture. That they are sometimes taken unwittingly by persons who drink from the streams which they frequent is, I think, not improbable. If my memory is not badly at fault a case was reported in a Pembroke newspaper about ten years ago of a boy from Sheen, on the Upper Ottawa, whose mysterious illness had long baffled the skill of local physicians. Powerful emetics were at length directed to be administered, and the boy was relieved from several loathsome living animals which, from the description published, I believe to have been a species of Salamander.

There are three or four species other than those recorded which will probably be found here. Every specimen observed should be

collected; and if in the larval form its metamorphoses should be carefully noted. These observations, when collected and compared, would be useful as the basis for a paper of interest and value on the Salamanders found in the vicinity of Ottawa.

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REPORT OF THE CONCHOLOGICAL BRANCH.

To the Council of the Ottawa Field-Naturalist Club:

The absence of my colleague, Mr. Poirier, and my own business engagements have prevented this branch from doing during the past year the amount of work that it should do. Very little collecting was possible. At Buckingham on our first excursion a number of shells were taken, *Succinea obliqua* was on that occasion found in quantity at the roots of sugar maples in the grove north of the railway station. *Sphaerium occidentale* was also found in abundance in ponds in the same locality. One specimen of the rare *Zonites binneyanus* was found about a mile up the Lievres, but no other shells except the commonest species were noted.

Late in the season the microscopic *Helix minutissima* was found in considerable numbers under poplar logs in a moist station on the Exhibition Grounds. In this locality I collected in a few minutes more specimens of *H. minutissima* than I had seen in the previous five years.

It is well known that many land shells which occur in Western Ontario, some of them very beautiful, are not found in this vicinity. An attempt has been made to establish these species here. Through the kindness of Mr. G. W. Dean, of Kent, Ohio, and Mr. Geo. J. Streator of Garrettsville, in the same State, I was enabled to place in the woods at various points around Ottawa, and in my garden, in the city, a number of living shells, including *M. thyroides*, *M. multilineata*, *Triodopsis tridentata*, *T. palliata*, *Patula solitaria*, *P. perspectiva*, *Zonites ligera*, and *Stenotrema hirsutum*. I was unable to visit afterwards the localities outside the city in which the shells were placed, but of those which were under my eye at home I observed that *Zonites ligera*, *Patula solitaria*, and *P. perspectiva*, all died. The others lived. *M. multilineata* seemed to flourish best, and in November young

shells four-tenths of an inch in diameter were to be found by the dozen in the corner in which five adult individuals has been placed in the month of June. The other species which lived, with the exception of *H. tridentata*, did not appear to multiply. I may say that the gentlemen who obtained the shells in Ohio were kind enough to furnish me with information as to the peculiar habitat of the different species, and I tried to establish each in a station suited to it. I was able to do this in the woods much better than at home, and it is not improbable that the majority of the shells thus disposed of may establish themselves here.

In former years I tried to introduce the English species found at Quebec, *H. rufescens* and *H. cantiana*, but without success. The latter species deposited eggs, but the young shells soon succumbed owing to climatic influences or the want of suitable food.

It will be of interest to observe whether the experiment made with the western shells will not be more successfull. Possibly should land shells be found here larger in size and more beautifully coloured than the native species, more members of the Club would take an interest in their study.

F. R. LATCHFORD,

Ottawa, January 27th, 1887.

ENTOMOLOGICAL SOCIETY OF ONTARIO.

Annual Meeting, 1887, at Ottawa.

An event of considerable scientific interest was the Annual Meeting of the Entomological Society of Ontario, which was held in this city on Wednesday and Thursday, 26th and 27th October. The officers and members of the Ottawa Field-Naturalists' Club received an invitation to all the sessions.

On Wednesday two Council meeting were held and visits were paid to the Geological Museum and Experimental Farm. In the evening the President, Mr. James Fletcher, delivered the Annual Address in the Civic Council Chamber. It outlined the origin and progress of the Entomological Society, and then treated of various injurious insects which had been more or less destructive to field and garden crops during the past summer. The address was of much practical value, and was listened to with interest by a large audience, among whom were many members of our Club. A vote of thanks was moved by Rev. C. J. S. Bethune and Prof. Saunders, both of whom made appropriate and interesting speeches. Mr. Harrington had on exhibition his large collection of Ottawa Coleoptera, arranged in eighteen cases, and numbering over 1,250 species.

On Thursday sessions were held both in the forenoon and afternoon in a commodious Committee Room. After the usual presentation of Reports, etc., the election of officers was held and resulted as follows *President*, James Fletcher, Ottawa; *Vice-President*, Mr. E. Baynes Reed; *Secretary-Treasurer*, Mr. W. E. Saunders, London; *Council.*—Rev. C. J. S. Bethune, Port Hope; W. Hague Harrington, Ottawa; Rev. T. W. Fyles, Quebec; J. M. Denton, London; Rev. Geo. W. Taylor, Victoria, B. C.

Rev. C. J. S. Bethune read a very interesting paper on *Aletia argillacea*, the celebrated cotton moth which does such enormous injury to cotton in the Southern States. He described its occurrence in great numbers at Port Hope on the 8th and 9th October. Mr. Harrington gave an account of a similar appearance of the insect at Ottawa on the evening of Sunday, 9th October, when great numbers were attracted

by the electric lights. The following morning he had observed at least 250 or 300 on the front of the Ottawa Bank. Mr. Moffatt stated that immense swarms of the moths had visited Hamilton on the evening of the 7th October. It has been for many years a debated question whether the insect breeds in Canada or immigrates from its southern habitat, and its presence in such immense numbers this autumn would seem to favour the latter view.

Mr. Fletcher exhibited a beautiful case of butterflies containing specimens of several rare species of Chionobas, &c, including *C. Macounii, C. Gigas* and *C. Californica*. He spoke of the rarity of the species and explained that nearly all the specimens shown had been captured by Prof. Macoun during his explorations at Nepigon and in British Columbia. A paper was submitted from Rev. G. W. Taylor, of Victoria, giving an account of an ascent of Mt. Finlayson in search of *Chionobas gigas*. Prof. Macoun stated that he had accompanied Mr. Taylor and gave some interesting particulars of the habits of the butterflies collected by him. We have not space to give further details of the papers and discussions, but the following papers were among those read :—

"Some remarkable Captures during the summer of 1887," Capt. Geddes ; "Nuptials of Thalessa" and "Further observations on Oryssus Savi," W. Hague Harrington : "Species, varieties, &c.," J. Alston Moffatt.

Mr. Harrington's collection of Ottawa beetles and Mr. Fletcher's fine series of butterflies were on exhibition throughout the meetings.

It will be observed from this report that an active part in the proceedings was taken by members of our Club.

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EXCURSION TO KIRK'S FERRY.

The Fifth General Excursion was held on the 17th September. The locality chosen for investigation was Kirk's Ferry, on the Gatineau River, about 12 miles from the city. The weather was perfect. It was one of our lovely Canadian autumn days, with a soft warm breeze, a bright sun, and the damp air filled with the scent of the woods. The members turned out in good numbers, and three heavily loaded vans carried the happy party from the dust of the city out into the pure air of the fields. The Chaudiere Falls first attracted the attention of the party. On account of the exceptional drought of this season, the water in the Ottawa River was so low that workmen were walking right across the river within 100 feet of the edge of the Fall, an occurrence which had never been previously recorded.

The bridge over Brigham's Creek was being repaired and one of the vans having gone by the Chelsea Road would have had a long return journey but for the low water. Owing to this, however, they were able to drive over the creek and join the rest of the party without trouble.

As the mountains were approached there were frequent exclamations of surprise and admiration at the gorgeous tints of the landscape. The vivid autumnal hues of the Maples, Beeches and Ashes, combined with the sombre shade of the Evergreens, rendered the scene one of great magnificence. Nor was the foreground less attractive. Beneath the shade of the spreading Butternut trees, which grow in great luxuriance along the Mountain Road, graceful ferns and lovely mosses find a fitting home. Bright berries and gaudy fungi, too, add to the beauty of the picture. It was with difficulty that the leaders could restrain the impatience of the members till the destination was reached—about noon. Here they were led by the President to a secluded bay where the luncheon baskets were opened. In front were the wild rapids of the Gatineau, fringed by a beach of silver sand, behind rugged rocks thickly clothed with verdure—a lonely spot, where some of the party chose to spend the whole day. After lunch the different leaders made up their parties and started off without delay so as to have as

much time as possible in this new locality. There were present several Geologists, and under the guidance of Mr. Brumell many minerals and objects of interest were collected. The Botanists were as usual well represented, and were well repaid for their labours. All the leaders and Prof. Macoun were present, and made the exploration interesting to those who accompanied them, naming and explaining the nature of all the plants brought to them. Several new species were added to the list of plants recorded. The most notable being *Vaccinium cæspitosum*, a northern plant; *Vaccinium corymbosum*, var. *glaucum*; and *Solidago arguta*. Before leaving for home about an hour was pleasantly and advantageously spent in listening to the addresses of the leaders, which, owing perhaps to the new locality and the charming weather, seemed more than usually entertaining. The President, Mr. R. B. Whyte, with a few well chosen words introduced each speaker. Mr. Brumell, of the Geological Survey, explained the geological formation, and drew attention to the most important minerals discovered. Apatite naturally came in for a large share of attention, followed by Mica, Iron Pyrites and Hornblende; together with the other rocks found in the Laurentian formation. Following Mr. Brumell, Mr. Amos Bowman, also of the Geological Survey, spoke on the methods of working some of the minerals referred to, and especially spoke of the surface deposits of the district. Prof. Macoun, in his usual happy style, spoke of the plants collected, and the pleasures of a naturalist's life. Mr. Fletcher spoke of the insects, and gave some insight into the habits and life-histories of some specimens exhibited. The party reached town again about eight o'clock after a most successful expedition.

SUB-EXCURSIONS.

TWELFTH.—A party led by the President visited the Beaver Meadow, Hull, on the 27th August. The weather was charming and the woods were just putting on their gorgeous autumn dress. The Asters and Solidagos were in their prime and furnished a fertile field for study. Along the banks of the Beaver Meadow fine examples of the Closed Gentian *G. Andrewsii* were collected, and in the river *Bidens Beckii* was found flowering freely. At the same time the striking leaves and flowers of the Pickerel-weed, *Pontederia cordata*, were conspicuous objects. The President explained the chief points of interest about each species as found, and a most pleasant afternoon was spent in this favourite locality.

THIRTEENTH.—On 3rd September an enjoyable excursion was held to Billings Bridge. A full van of members left the usual rendezvous at two o'clock. The President and Dr. Baptie led the party. On arriving at the Bridge the party walked up the north shore of the river as far as Dow's Swamp. Amongst the low herbage in the woods, *Cuscuta Gronovii*, the "Dodder" was found, closely embracing in its deadly grasp plants of *Boehmeria cylindrica*, the Stingless Nettle.

A tree of *Celtis occidentalis* attracted a great deal of interest from the diseased state of its foliage; every leaf bore from 5 to 25 galls of the pretty little Homopteron *Psylla celtidis-mamma*. Asters and Solidagos were very conspicuous and many species were examined and compared.

FOURTEENTH.—On 10th September it was decided to again visit the Beaver Meadow at Hull, a locality always full of interest to collectors. Many berry-bearing plants now attracted attention, and the seeds of various plants were examined. The Ashes and Hawthorns were particularly drawn attention to by Prof. Macoun. *Nesaea verticillata*, the Swamp Loosestrife with its aquatic stems and roots was an interesting topic for discussion. Some of the members amused themselves collecting the autumn leaves of Maples and other trees, which were particularly gaudy this season. The ornamental seeds of *Clematis Virginiana* were also gathered in large quantities. Prof. Macoun collected a large number of Mosses and Lichens, the most important of which he exhibited.

Fifteenth.—On the afternoon of the 28th September a few active workers of the Conchological Branch, including two ladies, met at Ratté's and procuring a large skiff rowed down the Ottawa to Duck Island. This locality is remarkable for producing in abundance one of the most beautiful shells found in the inland waters of North America. A few specimens of this species, *Unio occidens*, Lea, were observed on the bar which runs from the head of the island towards the Quebec shore; but no attempt was made at collecting until a landing had been effected opposite Templeton Wharf, and the appetites of the party, sharply whetted by the long pull down the river, had been appeased by a hearty luncheon. The excursionists then divided, some remaining on the Northern shore and the others crossing the island. On the Southern side *Unio Occidens*, *U. borealis*, *U. ellipsis* and a large coarse form of *U. complanatus* were very common. A still larger but less ponderous variety of *complanatus*, pale in colour and beautifully rayed, was found sparingly, and for the first time since 1881. One specimen of *U. alatus*, and a few *U. gracilis*, *U. rectus* and *U. gibbosus* were taken near the lower end of the island, all in fine condition. In the meantime those upon the North shore had not been idle. They had collected great heaps of *Unio occidens*, *U. complanatus* and *U. ellipsis*, with several *U. borealis* and a few *U. gracilis*. One specimen each of *Anodonta undulata* and *Margaritana undulata*, the latter of remarkable size, was also found. The material of the afternoon's collecting was carefully examined before leaving, and any not required were replaced in the waters. All the shells selected were remarkable for size, beauty or variety, and the *Unio occidens* rival in brilliancy of lustre and variety of form and coloring the choicest productions of tropical seas. A long pull, after a second attack on the lunch baskets, landed the party at Ottawa highly pleased with the result of the excursion.

Sixteenth.—The special object of this sub-excursion of the 1st October was to investigate the different species of Fraxinus found in the locality.

Rockcliffe was the locality visited, and many different trees were examined. Specimens of the seed of the Red Ash (*F. pubescens*), the White Ash (*F. Americana*) and the Black Ash (*F. sambucifolia*) were

gathered for cultivation. *Prunus pumila* was found to occur in some abundance round the rocky base of Rockcliffe, and *Astragalus Cooperi* was not uncommon. Several species of Aster and Solidago were examined, and the only locality in the neighbourhood, so far found, for *Ceanothus Americanus* the New Jersey Tea, was pointed out.

Seventeenth.—A party belonging to the Botanical Section made an expedition on 8th October to Beechwood to look for *Aplectrum hiemale*, a rare orchid. They were, however, unsuccessful in their quest, but were well repaid by the discovery of many other plants. Mr. Fletcher explained the theories with regard to the growth of parasitic and saprophytic plants. Fine specimens were collected of *Comandra umbellata* growing attached to the roots of *Amelanchier Canadensis*. Roots of *Monotropa uniflora* were found showing, in some instances, a new bud for next year's growth. Attention was drawn to the similarity of the seeds of some of the Ericaceæ to those of Orchids.

Eighteenth.—Another expedition was made on 15th October for the same purpose as the preceding; Lieut.-Col. White, who had already found *Aplectrum hiemale*, was with the party and led them to the locality where he had discovered it. After a short search beneath the fallen leaves Mr. Fred. Magee succeeded in finding a fine patch of three plants—two of these bore two leaves each. This curious plant throws up in the autumn a large handsome ribbed leaf somewhat like the Lily of the Valley, it is dark green above and purple beneath. In the following summer a tall spike of purplish flowers appears in June or July, and then when this is mature an underground stem is produced bearing at its tip a bud which gradually is enlarged till it becomes a solid corm. From this the autumn leaf is borne. Sometimes, as in two of the plants referred to above, there are two of these bulbs on a plant. The old bulbs remain a year or two in the ground before decaying, so that there are thus sometimes three or four connected. The popular name of this plant is "Putty-root" or "Adam and Eve," the latter refers to the old and new bulbs being found connected. This kind of root is not, however, an uncommon occurrence amongst Orchids. Many of our common species have twin roots as we find in *Habenaria Hookeri* and many others.

NINETEENTH.—Despite the coolness of the weather a number of members of the Club and their friends left the city Post Office at 9.30 a.m., of 22nd October, and proceeded by way of the Montreal Road, in Gloucester, to the mouth of Green's Creek, some six miles distant. The drive down was rather cool, but by eleven o'clock, when the Creek was reached, the bracing weather had moderated, and when collecting began the excursionists soon felt comfortable. One o'clock brought the party together and the specimens contained in the baskets were eagerly discussed. Before lunch the upper portion of the Ottawa River shore had been searched for nodules and recent shells with considerable success, whilst the lower portion of the beach below the mouth of the Creek proved to be less rich in the sought for specimens. The party decided to make a halt on the way home at the Sulphur Springs, situated on the same creek, and close to where the bridge on the Montreal Road crosses it. This place was soon reached, and on the way the outcrop of the shales belonging to the Chazy Formation along the road, with the newer limestones flanking the hill, to the south, about half-a-mile east of the toll-gate, were examined. The waters of the springs having been tasted and an additional number of nodules collected up the creek, especially of that kind which is spheroidal in shape. The party re-assembled and in conformity to the usual custom, the leader in Geology, Mr. Henry M. Ami, who was present, was called to say a few words on the result of the day's outing. He accordingly briefly described the formation of rocks which had more particularly engaged their attention during the day, viz., the "Leda Clay" formation. The origin and mode of deposition of the clays and the animal remains to be found in them were pointed out, after which Dr. Bell, of the Geological Survey, made some remarks respecting the theory of elevation and subsidence of Continents, referring more particularly to Prof. Croll's theory of tidal action in the long lapse of time. This done, the excursionists returned to the city in good time, quite satisfied that a pleasant day had been spent, A number of ladies were present, which speaks well for the interest which they manifest in the natural history studies with which the Club is engaged.

LIBRARIAN'S RECORD.

Brooklyn Entomological Society: Entomologica Americana, Vol. III, No. 6.

Montreal Natural History Society: The Canadian Record of Science.

Cincinnati Society of Natural History: Journal, Vol X, No. 3.

Essex Field Club, England: The Essex Naturalist, Nos. 7, 8, 9.

American Ornithologists' Union: The Auk, Vol. IV, No. 4.

Torrey Botanical Club: Bulletin, Vol. XIV, Nos. 9 and 10.

Entomological Society of Ontario: The Canadian Entomologist, Vol. XIX, Nos. 9, 10 and 11.

New York Microscopical Society: Journal, Vol. III, Nos. 3 and 4.

L'Université Laval: Annuaire, 1887-88.

Dr. W. A. Kellerman: Journal of Mycology, Vol. III, Nos. 9 and 10.

Dept. of Agriculture, Manitoba: Crop Bulletin, No. 21.

Meteorological Service of Canada: Report, 1884.

MONOTROPA UNIFLORA.

To the Editor of the Ottawa Naturalist:—

Dear Sir: In the June number of the *Ottawa Naturalist* I notice some views expressed by Mr. Fletcher on the growth of Monotropa. I feel assured that his views are correct. In the summer of 1873 I was searching in a hardwood bush for roots of *Aplectrum hiemale*, when I found several bunches of roots which I at once took to be those of *M. uniflora*, but there was no appearance of flowering stems. I also observed that they were securely attached to roots, about three-sixteenths of an inch in diameter, of what I took to be maple, but which may have been beech.

There could be no doubt about the parasitic attachment. At first I imagined that the flowering stems had been plucked, but on examination this was evidently not the case as no signs of injury could be found; moreover it was in the month of July, too early in the season for the flowers to have appeared. I marked the place carefully, and drove in several pegs beside roots which were but little disturbed. I revisited the spot towards the end of September, after I had found several in flower, but found all just as I had left it; not a plant was to be seen. In September of the following year I happened to be driving within a short distance of the locality, so tying my horse I went carefully over the ground and found the flowers so numerous that from a small area I could have gathered a large basketful. From want of time I did not carry the investigation further, but this was enough to convince me of the accuracy of Mr. Fletcher's statements.

Wm. Brodie.

Toronto, 3rd June, 1887.

[Note.—With regard to the above interesting subject, upon consulting Prof. Macoun, he states that he agrees with the general tenor of Mr. Brodie's letter, but adds with regard to the host-plant, that he is sure that Monotropa grows upon the roots of other plants besides the Beech, as he has found it in many districts where that tree does not occur. In British Columbia he found it common in Coniferous woods where no deciduous trees grew. It is also abundant in the cold woods of the Gaspé peninsular, on Anticosti, and in some parts of Nova Scotia where the Beech is unknown. He is of the opinion that valuable information would undoubtedly be gained by carrying out the experiment suggested in the June number of the *Naturalist* of growing these plants from seed.—Ed.]

EDITORIAL.

Since our last editorial appeared—in the May number of the *Naturalist*—summer has come and gone, and snowstorms* and frosts give warning of the approach of winter. The collecting season, for most branches at least, is over, and we have no more pleasant Excursions, or Saturday Outings to announce. The work of the Club, however, finds no stay; it ends not with the summer, but merely changes with the seasons. All the varied treasures gathered from field and forest, from cliff and quarry, have yet to be carefully examined and prepared for the herbarium, or the cabinet, otherwise they will be as useless as the miser's gold stored in hidden recesses, and will be liable like it to be before long lost. A great store of specimens in all branches should be the result of the past season's work, facilitated as it has been by so many Excursions and Outings. Amongst these specimens must be many valuable and rare species; additions to our lists; perhaps forms new to science. These will require special and critical study, in order that they may be properly recorded for the benefit of naturalists elsewhere.

Any member having notes of interest should, if they be not intended for presentation in a special paper, forward them without delay to the Leaders of the several Branches, to enable them to prepare their Reports on the season's labours and conquests. The Soirée Committee has now nearly completed what we trust will be an attractive programme for the Winter Lectures and Classes. This will appear in full next month; and the date for the first Soirée has been fixed for the 9th December, when the Annual Address will be delivered by the President—Mr. R. B. Whyte.

A report will be found in this number of the Annual Meeting of the Entomological Society of Ontario, which was held in the city for the first time since the organization of the Ottawa Field Naturalists' Club. The meeting lasted two days, and, as the officers and members of our Club had received a cordial invitation to attend all the sessions,

*The first of these was on Sunday, 23rd October, when snow fell for several hours, and in unusual quantity for such an early date. A week later there was another fall lasting all day.

many availed themselves of this opportunity of acquiring more knowledge of the insect world. We were particularly gratified to see so many present on the evening when the President delivered his address, as it evidenced such an interest as should be taken by our members in the work of a kindred society.

We would particularly impress upon any members who may not yet have paid their subscription fees for the current year, that these dues are payable in advance. Formerly when the transactions of the Club were published almost at the close of the year, the Treasurer did not find it necessary to call upon the members before that time, but under the present method of monthly publication the Treasurer (Mr. James Fletcher, Experimental Farm) has corresponding payments to make, and must look to the members to provide him with the required funds.

Another, and very important, way by which the treasury can be repleted, and the Club at the same time strengthened at every point, is in the securing of new members. There are undoubtedly still many persons in the city who might derive both pleasure and advantage from attending the Lectures and Classes of the coming winter, and who only await information as to the objects and work of the Club to induce them to join it.

Members will have observed no doubt that the September and October numbers of our magazine contained only twelve pages each. The eight pages thereby at present lost will, however, be regained when the proposed revised List of Ottawa Plants is ready for publication, and will enable the first portion of that list to be printed without subdivision. This new list of our plants will be one of great value to botanists, as numerous additions have been made to the "Flora Ottawaensis" published in Transactions No. I, and information regarding the habitat, etc., of each species will be given.

NOTES ON, AND THE PRECISE GEOLOGICAL HORIZON OF SIPHONOTRETA SCOTICA, DAVIDSON.

BY HENRY M. AMI.

(Read March 3rd, 1887.)

At the Montreal Meeting of the American Association for the Advancement of Science in 1883, Mr. J. F. Whiteaves, Palæontologist, &c., to the Geological Survey of Canada, read a communication or paper before the Geological Section, in which there was recorded for the first time on this continent the occurrence of a beautifully fringed, or spinose brachiopod, which, from specimens sent him, Dr. Thos. Davidson, the eminent authority on the Brachiopoda, had recognized to be referable to a form which he himself had described as Siphonotreta Scotica. The specimens thus referred to de Verneuil's genus *Siphonotreta* had been collected by Mr. J. W. H. Watts, of the Ottawa Field-Natura'ists' Club, and that gentleman had handed them to Mr. Whiteaves and subsequently presented them to the National Museum at Ottawa where they are now exhibited in the cases. The specimens in question had been obtained from blocks of impure limestone lying near Mr. Watts' residence at Cummings' Bridge, near Ottawa, and were said to have come out of a well sunk by the same gentleman on his property. There was but little doubt, both from the lithological aspect of the rock containing the specimens of Siphonotreta and other fossils found on th's property, and from the *facies* of the included fauna, that the measures whence they came were referable to the Utica Formation. For some time, however, a certain amount of doubt was entertained by a number of palæontologists as to the precise geological position of the interesting form under consideration; but, from recent investigations made with the special object in view of clearing this point, the writer, in conjunction with Messrs. McConnell, Hayter and other members of the Ottawa Field-Naturalists' Club has made a number of excursions during which specimens of this beautiful shell were collected.

In order to ascertain definitely the true horizon of the Siphonotreta in question, it was necessary to find it in situ, and further to obtain from the same bed or beds in which it occurs as many species of fossils as possible, in other words, determine what were its contemporaries. It had been previously pointed out that the lowest measures of the Utica formation about Ottawa consisted in a series of impure bands of limestone at times, slightly dolomitic and interstratified with black brittle bituminous shales all abounding in fossils. (See Geological Report, Transactions Ottawa Field-Naturalists' Club, Vol. I. No. 4, p. 66; also Vol. II, p. 347). The close resemblance in lithological character between the specimens sent to Dr. Davidson by Mr. Whiteaves and the rocks constituting the lower portion of the Utica formation where it crops out along the right bank of the Rideau River, opposite the Rifle Range, near the rapids, was such as to warrant a careful search for *Siphonotreta* in that locality. After a somewhat careful search on the part of those members of the Club above mentioned, a goodly number of specimens of this interesting species were found at the rapids along with other forms to be mentioned later on.

The precise bed in which *Siphonotreta Scotica* occurs, is that band of impure bituminous limestone, black or dark brown in colour, which crosses the Rideau River at this locality and forms the rapids or slight fall, giving the peculiar orographic aspect to that portion of the river which it possesses and dividing the smooth flowing water above this point stretching on to near Hurdman's Bridge from the rapid running waters below.

The following is a section of the measures of the Utica formation exposed at the head of the rapids opposite the Rifle Range, and includes the zone of Siphonotreta Scotica. The middle and upper measures of the Utica have been denuded away, especially during glacial times, and the uppermost beds of the section are capped with Post-Tertiary deposits made up for the most part of debris of the 'till' and Saxicava sand and associated gravel formations with 'erratics' in abundance, the 'Leda clay' having been washed away in latter times. The section is given in descending order:—

	CHARACTER OF BEDS, THE THICKNESS, &C.
These upper measures consist of very soft, brittle and friable bituminous shales holding *Triarthrus Becki*, Green and other fossils.	(Shales.) Thirty inches.
Band of hard compact impure limestone teeming with the remains of *Conularia Trentonensis*, Hall, and holding also *Zygospira Headi*, Bill, *Leptæna sericea*, Sow. Orthis testudinaria Dal. Calymene senaria, Con., &c., &c.	(Limestone) One inch.
Zone of Siphonotreta Scotica. Band of black impure bituminous limestones gradually passing into a series of calcareo-argillaceous shales, at other times compact and breaking with a conchoidal fracture, holding abundance of fossils. (See lists.)	(Limestone.) Zone of Siphonotreta. Varies from eight to twelve inches.
Black and brittle impure (calcareo-argillaceous) shales, bituminous and holding the remains of *Asaphus Canadensis*, Chapman.	(Shales.)
Band of impure limestone.	(Limestone.)
Shales, very bitnminous and brittle.	(Shales.)
Band of impure limestone.	(Limestone.)
Brownish-black beds of shales, very brittle and bituminous.	(Shales.)
Two bands of an irregular and unevenly bedded limestone containing *Orthoceræ* and other fossils but poorly preserved; limestone dark and somewhat bituminous.	(Limestone.)

From the band of impure limestone holding *Siphonotreta* the following species of fossils have also been found intimately associated therewith :—

1. Batostoma erraticum Ulrich.
2. Lingula curta, Hall.
3. " elongata, Hall.
4. " quadrata, Eichwald.
5. Leptæna sericea, Sowerby.
6. Strophomena alternata, Conrad.
7. Orthis testudinaria, Dalman.
8. Zygospira Headi, Billings.
9. " modesta, Say.
10. Zygospira (probably a new form).
11. Conularia Trentonensis, Hall.
12. Asaphus Canadensis, Chapman.
13. " platycephalus, Stokes. vel megistos, Locke.
14. Calymene senaria, Conrad.
15. Beyrichia oculifera, Hall.
16. Leperditia cylindrica, Hall.

A mere glance at the fauna which thus characterizes the zone of *Siphonotreta Scotica* in America is sufficient to indicate that the measures whence they came belong to the Utica Formation, in the upper portion of the Cambro-Silurian or Ordovician System. A single hand specimen showed the following interesting association of species :—

1. Siphonotreta Scotica, Dav.
2. Leptæna sericea, Sow.
3. Zygospira Headi, Bill.
4. Asaphus Canadensis, Chap.

From specimens obtained at the head of the Rifle Range Rapids along the Rideau River by the writer and from those of the National Museum collection kindly placed at the disposition of the writer by Mr. Whiteaves, the following notes have been gathered :—

Specimen No. 1.—Collected at the rapids along the Rideau River, opposite the Rifle Range, in Gloucester. Collector H.M A., 1886.

This specimen agrees well with the beautiful and clear description given by Dr. Davidson in his "Supplement to the British Silurian Brachiopoda, 1882-1884, p. 217," and only slight variations such as might be merely local can be observed. The dimensions of the shell are as follows:—*Length, twelve and a-half* millimetres; *breadth, eleven* millimetres; *height,* measured at about one third the distance from the beak to the anterior extremity, *two* millimetres. Length of the longest spines, seen along the anterior margin, *three* millimetres.

Specimen No. 2.—Collected by Mr. J. W. H. Watts on his property, Cummings' Bridge P. O., Ont, near Ottawa City, 1883.

This specimen exhibits the spines all around the outer margin of the valve from near the beak on one side round the front margin and near the beak on the other side. These spines, the longest measured as yet, gave *three and a half* millimetres, or one and a half lines in length. In the centre of the umbonal region where the valve rises abruptly from the beak near the latter there is a clearly defined sinus or groove extending only a short distance anteriorly and dying out on the gently covex or arched valve. This feature is also present in the next.

Specimen No. 3.—Collected by Mr. J. W. H. Watts at the same locality as No. 2.

A very typical example of the species indeed, whose length is twelve and a half millimetres (6 lines) and breadth ten and a half millimetres (5 lines). The height of the valve is two millimetres but the spines being partially or wholly imbedded in the matrix their length has not been ascertained exactly.

The three specimens above referred to, as mentioned before, agree well with Dr. Davidson's Scottish form *Siphonotreta Scotica*; nevertheless as it may possibly happen that the Canadian form exhibits the few points of variation constantly the varietal designation of *Si-*

phonotreta Scotica var. *Canadensis* now proposed, may perhaps not be entirely deemed inappropriate. The spines in the Canadian specimens examined so far are exceedingly minute and numerous, narrowly cylindrical, pointed and smooth for the most part, and somewhat broad and thickened at the base. Even under a high power of a microscope the spines appear to be smooth, no annulations being visible, whilst irregularly distributed punctures at times appear to be present—these are perhaps due to the mode of fossilization. The number of spines round the outer margin of specimen No. 2. (*supra*) has been roughly estimated at over three hundred, forming only one of the many rows of "adpressed spines" ranging from the beak to beak round the anterior front of the shell.

It may not be deemed out of place in this connection to give a a list of the species of fossils associated with *S. Scotica*, Dav., and collected at Craighead, in Ayrshire, Scotland, chiefly by Mrs. R. Gray, a lady whose researches in and contributions to palæntology are well known. They are all referred to the Llandeilo formation, a series of measures underlying the Caradoc-Bala group, all members of the Cambro-Silurian or Ordovican System. The list of Brachiopoda has been compiled from S. Davidson's "Supplement" (loc. cit.) and the Crustacea are taken from the admirable "Monograph of the Silurian fossils of the Girvan district," by Dr. H. A. Nicholson and Mr. Robt. Etheridge, jr., F.G.S.

The following is the list of species from Craighead in the Llandeilo formation from which *Siphonotreta Scotica* was obtained, those common to Canada all italicised.

BRACHIOPODA.

1. *Lingula quadrata*, Eichwald.
2. " Ramsayi, Salter.
3. Discinia perrugata, McCoy.
4. Acrotreta Nicholsoni, Dav.
5. *Leptæna sericea*, Sow.
6. " tenuicincta, McCoy.
7. " Youngiana, Dav.
8. " Grayiæ, Dav.
9. Leptæna Etheridgei, Dav.
10. (?) Orthis unguis, Sow.
11. Orthis Sowerbyiana, Dav.
12. *Orthis testudinaria*, Dalman.
13. " confinis, Salter.
14. " biforata. Schlothein.
15. " turgida, McCoy.
16. Strophomena rhomboidalis, Wilckens.
17. " Imbrex, Pander, var.
18. " expansa, Sowerby.
19. " retroflexa, Salter.
20. Rhynchonella Balcletchiensis, Dav.
21. " Peachii, Dav.
22. " Scotica, Dav.

CRUSTACEA.

1. Calymene Blumenbachii Brong.
2. Bronteus sp. (large form).
3. Cheirurus gelasinosus, Portlock.
4. Encrinurus punctatus, Brünnich.
5. Encrinurus punctatus var. arenaceus, Salter.
6. Illænus Bowmani, Salter.
7. " Rosenbergi, Eichwald.
8. Lichas Hibernicus, Portlock.

The association of *Siphonotreta Scotica*, Dav., has thus been given both as regards its Canadian and European contemporaries. There are are a number of other forms occurring throughout the section at the Rapids, in Gloucester, not mentioned which would swell the list considerably, but subsequent researches will help in ascertaining their precise affinities and lead to other forms being found.

There remains much work, however, to be done in ascertaining the internal characters of this pretty little spinose brachiopod which in Scotland and Canada used to flourish in the old Cambro-Silurian Seas.

Should any member of the Club find any specimen or specimens of *Siphonotreta Scotica* or of its Canadian variety which would throw additional light and show the muscular and other impressions of the interior of this shell belonging to the division of the Tretenterata, he or she would be conferring a favour to Science by contributing the same in the Club's Transactions or elsewhere.

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THE COUGAR OR PANTHER.

WILLIAM PITTMAN LETT.

(Read 10th March, 1887.)

This interesting animal (*Felis concolor*, *L.*) has been variously called Cougar and Panther in North America, Puma in South America, "Mountain Lion" in some of the Western States, and "California Lion" in California. Amongst the old trappers and hunters, it was known as the "Panther;" and many startling and wonderful stories have been told regarding its size and ferocity by those hardy pioneers of the wilderness, who followed their adventurous occupation, with their eyes always on the watch for the tomahawk and the scalping knife, and their ears ever open for the sound of the war-whoop. They dealt largely in the marvellous, in those far back times—those early days, before the woodman's exterminating axe and the resistless march of the battalions of civilization, had driven out from their forest fastnesses the great ruminants and the larger and fiercer carnivora which formerly abounded in localities where they are now unknown. The habitat of the Cougar is confined to the American Continent, ranging from Canada to the equatorial forests, and as far south as Terra del Fuego. It is found in the range of the Andes at an altitude of 9,000 feet, and is quite common in South America, as well as in the forests around the Rocky Mountains. It abounded, at one time, in the Valley of the Ottawa, in considerable numbers. The Cougar belongs to the *Felidae*, or cat family; and, except the Jaguar, is the largest animal of its kind in America.

A full grown cougar of the largest size of which we have any authentic account, measures eight feet in length from the point of the nose to the extremity of the tail, and weighs about one hundred and fifty pounds. In some rare instances, specimens have been found reaching the uncommon weight of two hundred pounds. In a recent interesting work on Wild Animals, written by Major Nutt, of Montreal, an account is given of a cougar which was killed in Texas, in 1883, which measured nine feet four inches, and weighed two hundred and forty pounds. "*The American Field*," an excellent

[illegible]n's paper, tells of the recent killing of one of these animals at Georgetown, El Dorado County, California, which measured nine feet from tip to tip and weighed two hundred pounds. This variation in size may be quite possible, for every hunter of any experience knows that the average weight of a large Virginian deer is about two hundred pounds, although, occasionally, extra large bucks have been met with, weighing two hundred and fifty, and even three hundred pounds.

The colour of the cougar is a deep fawn, inclining to white on the belly. The body is long and somewhat slender, and the height about two feet six inches at the shoulder. The tail is two feet long with a small tuft of stiff hair at the end. The legs are thick and extremely muscular, and the teeth are sharp, strong and dangerous looking. Like all animals of the cat tribe, the claws are keen, formidable and retractile, thus aiding in the seizure and retention of its living prey, as well as enabling it to climb trees with facility.

After a gestatory period of about ninety-two days, the female brings forth two kittens at a birth; sometimes, however, one, three or even four constitute her infant family. The young are produced late in the winter, or early in the spring. A reliable authority, William A. Conkling, Ph. D., Director of the Central Park, New York, speaking of panthers, remarks:—

"The cubs are born with their eyelids closed, they open after eight or nine days. The incisors and canine teeth cut through the gums in eighteen days. The body is at first spotted; the spots disappear in about six months. They are weaned when three months old. The mother carries the young about in her mouth in the same manner that a cat does." (Merriam.)

As I intend to adhere as closely as possibly to scientific facts, I shall make no apology for presenting you with a few admirable extracts* from a work, entitled, "The Mammalia of the Adirondacks," by Dr. Clinton Hart Merriam, of Locust Grove, in the State of New York—a volume which those who have had an opportunity of reading will readily acknowledge to be an able and valuable contribution to the Natural History of America. * * * *

*These extracts giving a very full account of the habits of this animal are, for want of space, omitted, and the reader is referred to Dr. Merriam's splendid work.

The cougar which you may see, very inartistically and unnaturally, set up in the glass-case before you must have been, when living, a remarkably fine specimen. As nearly as possible, he must have measured seven and a half feet from nose to end of tail. He was shot by a boy named Bentley, upward of forty years ago, on Croil's Island, on the south side of the St. Lawrence River, opposite Farran's Point, about ten miles east of Morrisburgh, with an iron spike or nail. The youth killed the animal with a single shot, a sporting exploit sometimes found difficult of accomplishment by experienced hunters.

About one hundred years ago, the panther was found in every part of Ontario and Quebec. I have been assured by reliable authority, that about forty years ago, two large specimens were frequently seen near the Village of Lachute, in the Province of Quebec. Since the days of of the adventurous Kentuckian, Daniel Boone, many thrilling stories have been told about the size, ferocity and destructiveness of the congar. It is well known that it has strong proclivities for the flesh of deer and smaller animals, and that, also, when pressed by hunger it has been known to destroy sheep and horned cattle; but we have yet to learn from any authentic record that one of its characteristics is to attack man, except when wounded and brought to bay. In the latter case, it will defend itself to the last with great fury. Under such circumstances, valuable hounds have frequently been killed in the attempt to close with it.

On the contrary many strange stories have been told from time to time, illustrative of the apparently unaccountable, friendly and even affectionate feeling entertained by it for the human race. I have read an account recently which is strikingly illustrative of ihe gentleness of of this interes'ing animal towards man. A farmer was travelling upon a lonely road in Washington Territory to a place called Olympia. The The road led through a thick bush for a mile or more. In the darkness, he became sensible of something rubbing against his leg, and at the same time heard a loud purring sound. On looking down he was terrified at the sight of a large panther walking along beside him. Every few yards the animal would bound off into the bush, only to return and repeat the cat-like action, and continue the purring. At

last, when getting near the clearance, he head the sound of waggon wheels; and fancying that the attentions of the panther were becoming aggressive, he uttered a loud scream, and the animal bounded away into the darkness. When the waggon arrived at the spot, the driver found the terrified farmer scarcely able to speak.

I have not quoted the foregoing interesting incidents as positive facts in natural history; but I imagine that there must be some reasonable foundation for narratives of the kind, or they would be unlikely to appear so frequently as they do. You are all acquainted with the beautiful story of the Roman Slave Androcles, and the Lion, and a most affecting tale it is, and perhaps, strictly true. If true, it speaks volumes for the almost rational gratitude of the king of the beasts. I have read, also, of a certain class of Asiatic priests who kept tame tigers which followed around like dogs, and were perfectly docile and harmless. The Cheetar (*Felis jubata*), the hunting leopard of India, forms a strong link in the chain of evidence, which goes to prove that many savage animals are susceptible of an educational transformation, which, in a great measure, neutralizes their supposed natural propensities. The Ounce, the American Leopard, and Panther, the Bengal Tiger and the South American Jaguar are untamable. Even the beautiful little Ocelot is not quite as tractable as a domestic cat.

From its length of body, strength of limbs, and litheness of form, the cougar is naturally possessed of immense muscular power and agility. These qualities are peculiarly requisite to enable it make the the sudden and swift rushes with which it suprises and captures its prey. Although a rapid and expert climber, it would appear, according to Merriam, that the cougar is not generally given to ascending trees. It was, however, supposed, and commonly believed, at one time, that its attack was usually made from some elevation, or from the overhanging branch of a tree. James Fennimore Cooper, in his famous and inimitable "Leather-Stocking Tales," which, as graphic pictures of Indian and hunter's life, and savage warfare are, *sui generis*, the most intensely interesting narratives ever written—gives many strange and attractive accounts, which would lead, more or less, to the belief that the panther, or "painter," is a much stronger, and a much more formidable animal than he really is.

Perhaps there is no carnivorous animal of the same size and genus, with the exception of the cheetah, that can leap so far for a number of consecutive bounds as can the cougar. A full grown one can leap twenty feet and upwards at each bound, for a distance of one hundred yards or more. I can readily credit this, when I know from personal observation, that the large wiry-haired Scotch staghound can cover twenty feet at each stride, and keep up the pace for a couple of miles. A large Virginian deer can leap from seventeen to twenty feet and keep up the gait for a considerable distance, when freshly started, with the matchless chorus of the hounds behind him. About six years ago, I had the curiosity to measure a single bound of a fine spike horned buck, after it had rushed down the steep side of one of our own Laurentian hills before the hounds; and I found that, from the spot from whence it had started to the point where its fore feet struck the earth again, the distance was one hundred and eleven feet, or thirty-seven yards. The descent or grade was, of course, exceedingly steep.

I have heard many an exciting story, and read many a thrilling account, of the blood-curdling scream of the panther, or, as this animal has been frequently called, the "catamount," but I have never seen one in the act of screaming, or under any other circumstances except in a menagerie. On two or three occasions, many years ago, I heard, in the thick forest near the Village of Richmond, and afterwards in the Township of Huntley, some strangely startling and frightful screams, which I then attributed to the cougar. Be this as it may, I have heard no screams of the same kind for the last thirty years.

Being always fond of music, I soon learned, not, however, without some trouble, to imitate the terror-striking scream of the catamount; and having been given to harmless practical joking, I have frequently accelerated the gait of nocturnal travellers, and had the pleasure afterwards to listen to their exaggerated accounts of narrow escapes. It never required more than two good yells to put the boldest to flight. * * * * * *

I think I have now told you all I know concerning the cougar. If I have entertained any of my hearers, or, better still have instructed any in the smallest degree, I shall consider myself amply rewarded for

the hours which I have spent in accomplishing the little of which I am capable, as a member of the Field Naturalists' Club of the City of Ottawa, an organization which, I am happy to say, numbers within its circle of membership, many able and scientific men. It seems to me that we have been placed upon this earth for the purpose of doing all the good we can to our fellow-beings in our day and generation. The public benefactor, whoever he may be, and whatever may be his talents, his powers or his influence for good, will always find his most gratifying reward in the contemplation of the progress, prosperity, enlightment or happiness, which he has been directly or indirectly, instrumental in promoting. He may be gifted with genius—he may be endowed with talent, yet he is deserving of no personal credit for the possession of either. But, if he has cherished, guarded and nurtured the celestial spark committed to his charge, until it has grown and expanded into a living flame, which has developed and brightened his own intelligence, and proved a beacon to guide the earnest searcher after truth, he is entitled to every honour and commendation for having at least endeavoured to accomplish the manifest behests of his own destiny.

That we have had in the past, and that we now have, amongst the throbbing millions of this vast world, great and gifted men in every branch of human industry, and in every avenue of human thought and human action, is due alone to the wonder-working power of that Omnipotent Hand that planted the firmament with the sun, the moon, the stars and the planets—that studded the arched equator of the blue ocean of the heavens with the glittering islands of the Milky Way; that clothed the earth with verdure and beauty; that laid the foundations of the mountains and fashioned "the Everlasting Hills;" that intersected terrestrial space with rivers and streams, and capped the towering climax of immeasurable might by infusing the resistless spirit of limitless aspiration into that mysteriously sublime something called the human soul. Here the finite is lost in the magnitude of the infinite! The most gifted, the most learned one of human kind, when he seeks to unravel the mystery of his own nature, pauses when he is confronted by God, and shrinks abashed before the majesty of the Incomprehensible!

NOTE ON FLOUR AND GRAIN BEETLES.

W. HAGUE HARRINGTON.

(Read 10th February, 1887.)

Among the insects which prove unwelcome visitors or dwellers in our houses are species of beetles which are almost universally distributed over the world, and which cause, sometimes, immense loss through their attacks on stored grain, or on its products. It is not my intention this evening to give any extended history of these obnoxious insects, but merely to mention the principal ones which occur here, and to call attention to the longevity of one species. The grub which is so frequently found in flour and meal is the larva of *Tenebrio molitor*, a beetle belonging to the Tenebrionidæ, several members of which occur in, or about, houses, and are known as "black beetles." The insect, in its several stages, is more abundant about bakeries, mills and flour ware-houses, than in ordinary dwellings, and is also destructive on shipboard. The grub is cylindrical in shape and about an inch long, burrowing and living in the flour. The beetle is of a blackish-brown colour, of moderate size, flying abundantly at night, and coming in at open windows. The grain beetles are very much smaller and belong to the Calandridæ, a family of the Rhyncophora or "snout beetles." They especially frequent granaries and flour mills, and in the former sometimes work great damage. Two species occur here, viz.: *Calandra oryzæ* and *C. granaria*, but not so far as I am aware in sufficient abundance to be very destructive, as they are in more southerly portions of the continent. The life history of these weevils is briefly as follows: The females bores with her long beak a minute hole in a grain of wheat, barley or rice, &c., in which she deposits an egg, from which hatches a little stout footless grub, or maggot, which burrows into the grain, feeding until fully grown on its substance, and then undergoing its transformations in the empty shell, which is all that remains when it comes forth as the perfect beetle. The mature insects, or beetles, also feed upon the grain, but do not so rapidly consume it. As you are aware, the duration of the life of the majority of insects is very brief, especially after they have reached the imago, or perfect state. Larvæ may live for several months, or even years, but their final transformations undergone they enter a brief existence, measured by weeks, days, or even hours.

Certain species, however, such as some bees and wasps live for almost a year, while some ants are said to live for several years. The specimens of *Calandra granaria* which I exhibit this evening are, when the average longevity of insects is considered, genuine patriarchs; their days have been long in the land. They were given to me on 4th July, 1885, by Mr. Latchford, who found a great number of them in a flour

barrel. Their age at that time was not known, but they have since lived quite happily in their limited quarters (a small pill box) and have nearly devoured the small quantity of grain then allotted to them. They must be nearly twenty months old.

NOTE.—Of ten of the above mentioned specimens four survived on 24th October, 1887, and one still remains alive on 30th November, 1887, or nine months and twenty days later.—W. H. H.

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SUB-EXCURSIONS.

TWENTIETH.—On the 5th November the clear, cool weather was favorable for a Geological Outing, and accordingly a small party paid a visit to an interesting exposure on the line of the Canada Atlantic Railway, of a formation not elsewhere observed in the vicinity. It was reached by a five mile tramp and found to consist of drab and brownish grey calcareous shales, holding in abundance the remains of petrified shells. These were very well preserved, the internal as well as external characters of a number of species being especially well shown, thus enabling the geologist to determine the structure of these extinct forms, which flourished and swam in the sea which in remote geologic periods covered this region. A large number of these fossils were collected and carried home for the purpose of further study.

On the same afternoon the Leaders of the Entomological Branch visited the Beaver Meadow, Hull, and nothwithstanding that the ground was covered with snow (about three inches) their explorations were well repaid. The objects especially sought for were galls, and a large number were obtained on roses, golden-rods, willows, etc. Several cocoons and pupæ of moths, such as *Samia Cecropia* and *Callosamia Promethea*, were also found. This shows that even at such a late date, and under apparently most unfavorable conditions, collecting could still be carried on with fair success, and that even in midwinter it would be still possible.

TWENTY FIRST.—A trip was made on 7th November by the Leaders of the Entomological Branch to Dow's Swamp, with the special object of collecting moss. This was not obtained, as might be supposed, for botanical puposes, but for the insects and shells which abound in it, and which find in it their winter residence. The ground was very wet, and the surface more or less frozen and snow covered, but a sufficient quantity was easily obtained to fill two large sacks, and to yield many specimens, a list of which may hereafter be presented to the Club. Numbers of the cocoons of *Nematus Erichsonii*, the Larch Sawfly, were found, showing that these insects had been abundant during the summer.

NEW MEMBERS.—31. Dr. Felix Cornu, Angers, Que. 32. R. H. Campbell. 33. A. O. Wheeler. 34. W. W. Hilbourn. 35. F. B. Anderson, Winnipeg, Man.

SOIREES.

1887.			
Dec.	8.	President's Inaugural Address.	Mr. R. B. Whyte.
1888.			
Jan.	5.	Clays, Sands and Gravels in the vicinity of Ottawa, and their continuations..... Report of the Geological Branch.	Mr. Amos Bowman.
"	19.	Our Forest Trees..... Report of the Botanical Branch.	Prof. Macoun.
Feb.	2.	Vegetable Parasites..... ..... Notes on Gall-forming Insects..... Report of the Entomological Branch.	Mr. James Fletcher. Mr. W. H. Harrington
"	16.	Autumn on the Ottawa River..... Report of the Conchological Branch.	Mr. A. O. Wheeler.
March	1.	Our Squirrels..... Report of the Ornithological Branch.	Mr. J. Ballantyne.

Members are requested to prepare short notes on any subject which may have been brought to their notice during the year, for presentation at any of the above meetings. Additions to or changes in the Programme will be announced in future issues of the OTTAWA NATURALIST.

The Soirées will be held in the Museum of the Ottawa Literary and Scientific Society, 25 Sparks Street, and the chair will on all occasions be taken punctually at eight o'clock.

ADMISSION FREE TO MEMBERS OF THE CLUB; TO NON-MEMBERS TEN CENTS.

MONDAY AFTERNOON LECTURES.

1888.

January	9.	Ornithology.	Prof. John Macoun.
"	16.	Geology.	Mr. Henry M. Ami.
"	23.	Mineralogy.	Dr. Geo. Bantie.
"	30.	Conchology.	Mr. F. R. Latchford.
Feburary	6.	Zoology—General.	Dr. H. Beaumont Small.
"	13.	Entomology.	Mr. James Fletcher.
"	20.	Entomology.	Mr. W. Hague Harrington.
"	27.	Botany.	Mr. R. B. Whyte.
March	5.	Mosses.	Prof. John Maccun.
"	12.	Classification of Plants.	Prof. John Macoun.

Any change in the above list will be duly announced in the OTTAWA NATURALIST.

It is aimed to make these lectures intelligible to those entirely ignorant of Natural History, and at the same time instructive to those who have made some progress in the study of the subjects to be discussed. They will be brief, in order that ample time may be afforded for subsequent discussion, and replies to questions.

They will commence promply at 4.15 o'clock, so as to be concluded by 5.30.

ADMISSION FREE.

Members of the Ottawa Literary and Scientific Society, and teachers in the various Educational Institutions of the city are especially invited to be present.

PRESIDENT'S ADDRESS.

Mr. R. B. Whyte.

(*Delivered, 8th Dec., 1887.*)

Members of the Ottawa Field Naturalists' Club, Ladies and Gentlemen:

I do not propose to-night to give you an elaborate paper on any special point of Natural History, but only to ask your attention for a short time to a brief address on a subject that should, at least, be interesting to all present: That of the Ottawa Field Naturalists' Club present, past and future, what we are doing, what we have done in the past and what I think we ought to aim at doing in the years to come. If you do not agree with my ideas of the work of the Club, I hope you will not scruple to say so, as there will be ample time for the fullest discussion, and on the right settlement of some of the points that I will refer to, the future prosperity and well being of the Club will very materially depend. It is with great pleasure that I can congratulate you on the continued and increasing prosperity of the Club. This is shown not only by the largely increased membership; a larger number having joined our ranks during the past season than during any previous year, but by what is of much more consequence the much greater percentage of the members who have taken an active part in the working of the Club. The fact too is particularly noticeable amongst those lately added to our number. A great encouragement to the council has been the sympathy shown in our efforts by those engaged in the important profession of teaching. These ladies and gentlemen recognizing the advantages offered from an educational point of view, have, many of them, cast in their lot with us, to the mutual benefit of all concerned. Original work has been vigorously prosecuted by the specialists in all the branches, and greater efforts have been made by the council to gain the interest of outsiders. The usual methods of procedure adopted in past years have been continued up to the present time, and the lectures and classes will be held during the present winter as heretofore.

At our first excursion the Club, for the seventh time, visited Kings Mountain, which seems to have lost none of its old time attractiveness for our members. In the past it has always proved the most popular excursion of each season, a record which this year it has added to by being the largest we ever had; no less than 119 members and friends taking part in it; nearly all of whom attempted the ascent of the mountain and no less than 75 gathered on the bare rock at the top, probably the largest number that was ever there at any one time. I do not wonder at the attraction it has for our members, as it would be hard to find a more delightful spot for a day's outing.

Our second excursion, on June 25th, was to the shores of Lake Deschenes, below Aylmer. This was a new locality and proved an excellent collecting ground for both Botanist and Entomologist, the flora being unusually abundant and showy, *Rosa blanda* and *Carolina* and the large showy flowers of our only wild lily, *L. Philadelphicum*, being found in great profusion. Being in Aylmer in the end of August, I went over the same ground and was much surprised to find it a barren waste with hardly a flower to be found. The change was partly to be accounted for by the excessive dryness of the season, but chiefly, I think, by there being but a thin layer of soil over the limestone, holding sufficient moisture to sustain growth during the spring and early summer, but under the hot summer sun becoming too dry for ordinary vegetation, only such deep rooting plants as trees and grasses being able to maintain themselves. The great contrast between my two visits shows how careful the excursion committee have to be to select the best season for each locality.

The success of our third excursion, on July 2nd to Buckingham, was somewhat marred by the unpromising appearance of the weather. When the hour came for the boat to start only 24 members were on hand, not half of those we expected; however, for those who did go, it turned out a most enjoyable day, as the clouds moderated the heat and made the somewhat long walk through the woods from the wharf to our rendezvous at the railway bridge a most delightful one. Most of the party passed the day in the vicinity of the falls, but a few of the more enthusiastic botanists walked up the river along the slide and

were well repaid, as thanks to a never failing supply of water from the leaky slide, the vegetation was very rich and luxuriant. Among the trophies they brought back were some Indian turnips with corms that almost rivaled the edible turnip in size, some of them being four inches in diameter. Our entomologists also were jubilant over the capture of many rare insects, amongst them being a female of the rare northern butterfly *Colias Interior*.

On August 13th we visited Britannia, and though nothing of marked interest was discovered a very enjoyable day was spent along the river bank. Above the station, near the lighthouse, were found large quantities of the handsome heads of the button-bush and the gorgeous spikes of the Cardinal flower.

On Sept. 17th was held the fifth and last excursion of the season to Kirk's Ferry and Falls on the Gatineau, four miles beyond Chelsea. The perfect weather, charming drive, and the many attractions of the locality visited all contributed to make it one of the most successful excursions ever held by the Club, and many wishes were expressed that the committee would hold our first excursion next season to the same place. It being our first visit our ever active botanists were diligent in searching for new species, and several additions were made to our list, the most notable being a new blueberry (*V. coespitosum*), a golden rod (*Solidago arguta*) and the curious grass (*Andropogon scopanus*). It was also an unusually interesting day for our Mineralogists, for in that great mineral reservoir the Laurentian formation, Phosphate, Plumbago, Mica, Iron Pyrites, Hornblende, &c., were abundant, especially in the cliffs along the river banks.

The sub-excursions, at which a large proportion of our work is done, have been more numerous and better attended than in past years. From the first week in May till late in the fall, when the weather permitted, these working parties, of which there were 21, left the Post Office at 2 P.M. every Saturday in charge of one or more of the leaders for convenient places in the vicinity of the city ; some of them rivaling our general excursions in the numbers that attended.

In the beginning of the season I suggested to the leaders that it would add greatly to the interest and value of these tramps if they

would give elementary lectures at each of them similar in character to those we have always had at the general excursions. My thanks are due to the leaders, particularly to Messrs. Fletcher, Harrington and Ami, for the able and efficient manner in which my suggestion was carried out. At nearly every outing simple elementary lectures were given on the Geological formation, plants and insects of the districts visited, in such a style as to be interesting and instructive not only to the student of those branches, but to every one present, no matter how slight their knowledge might be of Natural History. That a great additional interest was taken in these excursions, on account of the addresses, was evident from the improved attendance and the anxiety shown by those present to be at the rendezvous in time to hear the leaders, and by the manifest interest taken in their remarks.

The council of last year recommended to their successors that instead of issuing our transactions in a yearly part, which rarely appeared before the following winter, we should publish a monthly magazine under the name of the "Ottawa Naturalist." We have carried out their recommendation, and I think our little paper has been received with general favor by our members. Most of the papers and reports read at last winter's Soirées have appeared in it, and the next number will contain the last of them. We will now be able to print our papers shortly after they are read instead of waiting eight or ten months as in the past, when, as in many cases, they had ceased to be of interest. Another great advantage of a monthly publication is that we are able to give an official account of all our excursions during the month that is past and announcements of those for the following month, so that those members who are not able to take part in them are in a much better position to know what the Club is doing than by the old system. The last number issued (December) contains the programme of Soirées and afternoon Lectures for the present winter season, and you will, on referring to it, find that the meetings promise to be no less instructive and interesting than those of former years.

The number of our corresponding members remains the same as last year. Prof. Saunders, who has been in that position for several years, having been appointed Director to the Experimental Farm, and

taken up his residence here, becomes an active member. He will be a great acquisition to our Entomologists, who, though our most active and energetic members are few in numbers. Miss Ormerod, who has been chosen by the council to fill the vacancy, is the well known English Economic Entomologist. The Club is indebted to her for many favors in the shape of books and reports on Economic Entomology, all of them of great value.

I have now given you a brief sketch of what we have done during the past season, and it may not be amiss here to look back at what has been accomplished since our organization eight years ago. Through the wisdom of the first council a printed record has been carefully kept of all our transactions since the beginning, and when the question is asked, "what have you done?" we are now in the position to show from our volumes of transactions no unconsiderable amount of good solid work.

I have had the Transactions issued during the past eight years bound in one volume, which I now show to you. It is a goodly volume and contains a satisfactory record of the work of the Club. On examining the contents it will be seen that they are varied and interesting, and that every department of Natural History is treated of to a greater or less extent. I find that thirty-eight members of the Club have been contributors to the volume, and that it contains sixty-one Papers read at the Soirées, and also thirty-two Reports and eleven short papers or Notes.

As might be expected, Botany is found to head the list with nine papers; Entomology comes next in order with eight; Zoology, Mineralogy and Geology have each six; Conchology has three, and there are fifteen miscellaneous papers, among which are such as Mr. H. B. Small's on Museum Education, Sir James Grant's on the Brain, and Mr. W. D. LeSueur's on Design in Nature.

A valuable feature of the volume is the lists which it contains, such as those of Plants, Shells, Birds, Beetles, Fossils, etc.

But, important and valuable as our work undoubtedly has been in investigating and recording the results as shown by our transactions, there is another department of it which I think is of even greater

value, the educational work which we have accomplished. From the organization of the Club its Councils have recognized the importance of this phase of our work, and the number of active naturalists now connected with it shows that we have not labored in vain. Besides the elementary lectures at excursions, to which I have already referred, an important factor in our educational efforts has been our course of afternoon classes, these originating in a Botany class, conducted by Mr. Fletcher for three winters, developed into our Monday afternoon course of elementary lectures in all the leading departments of Natural History. These lectures are intended to be simply expositions of the main facts and principles of the subjects treated of, given in such a manner as to be understood by the merest novice and to be interesting to those further advanced, as is evident from the fact that many of our leading Naturalists make a point of always being present. The Council are pleased to see that these meetings are steadily growing in popularity, though still nothing like as well attended as they ought to be, considering how great are the advantages offered to the student, and all perfectly free of charge, open to all, young or old, member or non-member of the Club. I am sure if it was generally known that such an admirable course of instruction in these subjects was open to all who chose to avail themselves of it this room would not hold our audiences.

In the same line were two courses of lessons given in Central School West with special excursions in connection with them conducted by the botanical leaders ; by these and in every other way that seemed open to them the Councils have endeavored to cultivate a love for the study of Natural History, and upon the whole we have every reason to be gratified with the measure of success that has attended their efforts.

The foregoing being a brief account of what the Club has done and is doing, the question arises, what shall we do in the future, shall we go on in the same paths, endeavoring to perfect our work in the lines laid down in our rules, keeping it a strictly local club, or shall we, as some of our members, and some outsiders, have advocated, enlarge our bounds and convert our club into a general Natural History

Society? The principal reason given for this change is the follow ginal
It is said that Ottawa being the seat of the Geological Survey A
Experimental Farm, we could take advantage of the labors of m ely
bers of these institutions, which we cannot do to such a large exten the
we limit our lectures to a record of local work. of
a-
I do not recommend the change though there is something to l-
said in its favor. r

It seems to me that some change in the work of the Club is called for. We have pretty well accomplished our task of investigating and recording the results ; the small additions that have been made to our lists of late years show that not much now remains to be done, the average yearly addition to our plant list for the last five years is under a dozen. Our list of shells is fairly complete. We have only published one list of insects, the Coleoptera, but our Entomologists have the material for compiling lists of the other orders whenever we are ready o publish them. Our Geological lists are not quite so complete, but this work is of course done with special facilities by the Geological Survey.

Our greatest want in that line is in the Zoological branch, so far very little work has been done in that department. Next to nothing is known by our members of the common wild animals and reptiles of this locality, making it a fertile field for study and investigation, the only work that has so far been done being Mr. Lett s admirable series of papers on Ducks, Deer, the Otter, Black Bear and Puma, and Mr. Small's capital paper on "Our Ottawa Fishes." This season we are to have Mr. Ballantyne's observations on "Our Squirrels," but a great deal remains to be done. Every year our animals are becoming scarcer, and papers on the mammals or reptiles of the district would be interesting and valuable.

In the other departments though I have spoken of our work as being nearly finished it is only so as to collectors, there is still an immense field open to the Botanist and Entomologist in working out the life histories of the objects of his study, in the latter branch a good deal has been done, and our local Entomologists have done their share, but in botany there is ample scope for all our workers for many years to come.

value As an example I might refer to the discussion on Monotropa and Orgaomandra last winter and to the results arising from the questions thisien considered. Many other doubtful points call for further study. nee Iow little we know about the way in which our common wild flowers el are fertilized ; we know in a general way which are fertilized by wind in and which by insects, but the particular agents that perform the work n for each species are known in very few instances.

F Even in such an apparently simple matter as the circulation of sap there is a great deal of uncertainty, and there is reason to believe that the theory given in the text books requires revision. Many other points are as vague, but enough has been said to show that in the department of Botany there is ample room for all our energies.

But as I mentioned before, important as our work as collectors and investigators undoubtedly is, I think it second to our educational functions. I have already given you a brief sketch of what we have done in that way, and it seems extraordinary that so few have taken advantage of the opportunities we have offered them We have had not only to put the means of instruction before people, but have had to persuade them to take advantage of it. I have even heard parents say that they did not want their children to be bothered with learning even the few branches of Natural History that have been taught in our Public Schools, and this in the face of the enormous benefits which are acknowledged by all to have been derived from scientific investigations. It is not too much to say that the almost phenomenal strides which have been made in the progress of the world during the past century are due entirely to the development of scientific knowledge.

Having said so much this evening about our desire to develop the educational advantages of the study of Natural History, it may naturally be asked what are the advantages offered in this line by association with such an organization as our Club? I would answer there are certain direct advantages of a special educational value. First amongst these may be mentioned the inculcation of methodical habits of thought by which all discoveries must be examined. The results of each examination must then be carefully recorded in a neat and systematic manner ready for reference at any minute on some

future occasion. And much more so is this the case when original descriptions or discoveries have to be recorded for the use of others. A concise style and an accurate use of exact words are then absolutely necessary, and by so much as this is acquired to that extent will the work of any student be useful to science. A necessary part of thorough investigation in any branch of Natural History is the formation of a collection by which specimens are always on hand for examination, and in no way are the principles I have alluded to better exemplified. In the very collecting of the material the faculty of observation is cultivated and developed, the power to discriminate between species and to appreciate minute differences is attained.

The specimens when identified must then be carefully and neatly arranged and classified. Now all these are exercises of great use in properly training a mind to methods of thought which can be easily applied in any vocation of life when and wherever required. And it is not necessary nor even advisable to carry any of these studies (when used as a training for the mind) to a great length, we cannot all be Darwins or Lubbocks or Grays—no, the very elements of any branch of science are sufficient as the means for the practice of this intellectual training.

But in addition to these direct advantages there are also some of a more general nature to which, for a moment or two longer, I will draw your attention.

As the great aim in life of all human beings is the pursuit of happiness, I would mention first the pleasure it adds to life. No one who is not acquainted with the common objects of the woods and fields can conceive the keen delight experienced by a naturalist, when after the long imprisonment of our tedious winter, he is able again to go forth into the fields to look for the first appearance of our lovely spring flowers, to see the bursting of the buds and to listen to the call notes of the first birds, sweet harbingers of the happy summer time to come. To such a one all these are old friends, and the pleasure of greeting them year by year as they show their faces with beauty always fresh and new is not less than that experienced when we meet human friends from whom we have been separated for a long time, but with whom,

unfortunately, beauty gradually fades without a hope of renewal. Nor is this pleasure a selfish one for the Naturalist alone, it is enjoyed to a less but an appreciable extent by all those who associate with him. It was only a day or two ago that a member of our own Club bore testimony to this, in excusing himself for not taking up a special study, "I cannot find time for that, but I always attend the Club excursions when possible, simply for the enjoyment and benefit which I derive from going into the country with you." This naturally leads us to another advantage, namely, the benefit to health; and on this point I can speak from experience. For those who are confined indoors or to a desk by business, I do not think it is possible to exaggerate the value of a love for a study which impels them to leave the vitiated atmosphere of the city, and go far afield to seek their recreation out of doors and thus to breath the pure air of the woods, the fields and the mountain side. And again there is another feature about these studies which is no small advantage, the giving a knowledge of the natural beauties of the place we live in. In a world filled with beauty and in which, in fact, *everything* when properly examined *is* beautiful, it is by no means uncommon to hear thoughtless people say, wherever they may be, "there are no pretty walks or drives here;" to such I would say: "Are there any Naturalists in your locality? if so, ask them to show you, and then, I think, you will alter your opinion." I am led to mention this from the frequency of the remark, especially from new members when joining in an excursion, "I had no idea that there were so many pretty places about Ottawa."

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SOIREES.

First.—The opening meeting of the Winter Course for the year 1887-88 was held on Thursday, the 8th December, in the Museum of the Ottawa Literary and Scientific Society, when the President, Mr. R. B. Whyte, delivered his address, which is printed in this number, and which was listened to with much interest by the audience. On its conclusion Prof. Macoun, who occupied the chair, invited a full discussion of the suggestions and statements contained in the address. Mr. Fletcher thought that it was very necessary to carefully consider the past history of the Club, before attempting any change in its plan of operations. He was pleased to see so many teachers, and especially ladies, interesting themselves in the work of the Club, for if the future work was to be useful there was no better way to secure this end than by gaining the support of the teachers. Mr. Ami did not think that it was advisable at present to attempt an extension of the work, or a widening of the sphere of labour. Dr. Wicksteed suggested that desirable contributions to the season's programme would be papers on the city drinking-water, and the reported discovery of natural gas at Eastman's Springs. Mr. Fletcher, with reference to the suggested extension of the operations of the Club, considered that it was a question of such vital importance as to merit a most ample discussion, and one not to be rashly decided. There was still plenty of material unstudied in this vicinity, and requiring examination and description. At all the Excursions abundance of specimens had been found of great interest. Prof. Macoun said that about thirty years ago the late Mr. Billings had started the *Canadian Geologist and Naturalist*, a journal which still continues to lend its aid to science. Although the Club had been working for eight years, there was no scarcity of material to investigate nor could it be exhausted for many years to come, yet he was strongly of opinion that much would be gained by making the Club the nucleus, so to speak, of a general Natural History Society that would invite to it workers in all sections of the Dominion, and benefit by their labours. Under the present Constitution, whereby only papers on local subjects were invited, it was not possible for members whose duties carried them far afield, as for example the Geological Survey Staff, to

contribute any reports of their investigations. Mr. Ballantyne was in favour of some such widening of the plan of work, as would give interest to a greater number, and thought that much of value was at present lost by the limit set to the subject matter of papers. Dr. Baptie desired to draw attention to the value that records made in one department of science might have for workers in another department, apparently in no way connected therewith. As an instance he might state that he had been much interested in certain observations made by our entomologists last autumn. M. Guérard, a French author of repute, supposes the unusual prevalence—epidemic prevalence—of fevers in Europe, at certain periods, is due to the transportation of germs by atmospheric currents from the continent of America. A curious co-incidence bearing upon the view that certain fever germs may be conveyed by the wind to considerable distances is that just before the marked outbreak of fever, Mr. Harrington found large numbers of the cotton moth in Ottawa, October 9th. Their home is in the South. How came they here? By air currents—it is believed. If air currents brought the moths from the malarious South, might not the fever germs have been brought also? Those who entertain views akin to that of Mr. Guérard may find in this fact, brought to light by the Entomologists of our Club, a confirmation of their opinion, and especially so if the Meteorologists of the Club can show that storms, originating over the Gulf of Mexico and passing up the valley of the Mississippi, rarely, if ever, get beyond the valley of the Ottawa. A vote of thanks having been tendered to the President, he made a few remarks in acknowledgment thereof, stating that in his opinion papers from workers outside the present limits assigned by the Club would be of value to it, provided they did not in any way interfere, by creating additional work for the Council, with educational objects.

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New Members,—36. William A. D. Lees. 37. Miss Gertrude Harmer. 38. Miss May L. Grist. 39. Miss Marion J. Whyte.

TESTIMONY OF OTTAWA CLAYS AND GRAVELS TO THE EXPANSION OF THE GULF OF ST. LAWRENCE AND CANADIAN LAKES WITHIN THE HUMAN PERIOD.

By Amos Bowman.

(Read 5th January, 1888.)

It was my good fortune during the past summer to participate in many of the delightful excursions of the Ottawa Field-Naturalists' Club. The publication of some maps of mining operations in the Cariboo District, B.C., kept me out of the field of the gold-bearing gravels but not entirely out of the larger field of surface geology, and of the ancient rivers, which had a history in this country, as in most countries, before the present streams began their work of shaping the hills and valleys as we now know them.

Our first excursion to which I will make reference, was that to the Hogs Back, on the Rideau River, four miles south of Ottawa. Boulder clays were seen on the right bank above the falls; and next overlying them the leda clays along the canal, continuing to Ottawa City. These prepared us by laying a foundation for a section of the post tertiary or pleistocene tertiary, sometimes also called quaternary, of the neighbourhood, all these terms having nearly the same meaning.

The meaning of this pleistocene history of the country which is most significant to us is that of which we have a faint glimmering in tradition. It has been handed down by different races both savage and civilized; and is recorded in the sacred writings; dating from the most remote history of mankind, when writing was first invented to record the ancient traditions. It is that of the great flood, or sin flood, of which Noah was the hero, according to our version. In making allusion here to the myth of Noah I do so simply to remind you of a most notable feature of the pleistocene epoch, the record of which is so well marked in our surface geology that it is capable of being read with ease by any one; the memory of which has so impressed itself upon aboriginal mankind.

It had two remarkable features; the ice or glacial period, the record of which is seen in the boulder clays and later the great subsidence, or flood and lake period, the record of which is seen in the leda clays. The book of the boulder clays is more ragged and torn than that of the leda clays, yet it is quite readable, especially to those who have witnessed the action of glaciers, or solid ice streams. At the Hogs Back we saw simply boulders mixed irregularly in clay lying upon a smooth bed rock. In the valley of the Rifle ground we saw only boulders.

The principal difficulty in reading the simple record of the boulder clays, arises from the fact that our ice streams often became confluent by overflowing the dividing ridges, and the boulder clays are necessarily covered in most localities hereabouts by the later deposits of clay and sand. At the Quyon Creek, and at very many other places when looked for, the polished bed rock and tumbled clay containing boulders can be seen underlying the hills and benches, and the flat expansions into country fields of the leda clays. One of the these ice streams which came down the valley of the Gatineau left its debris in a terminal moraine behind Hull, directly opposite the Parliament Buildings. But this an old story, which you have all read—on the shores of Lake Deschenes and elsewhere.

I must not omit to mention the fact, well known to all geologists, that the gravels and other deposits of the glacial or flood period have yielded along with their shells, and their fossil fish, and mammalian bones, undoubted fossil human remains, from many, and scattered parts of Europe and America. They are chiefly arrow heads and utensils less perishable than bones, in washes of the streams,—not unlike those exhibited in the Geological Survey Museum. It is not strange therefore that tradition has taken cognisance, however vaguely, of the period of the floods.

The fact of the humble ancestory of mankind has been firmly established in recent years, by scientific proof that is no longer disputed. We may confidently look therefore in the gravels of the tertiary streams if we can find them, and identify them, for the evidences of mankind and his companions of that period.

Our excursion to Kings Mountain, twelve miles west of Ottawa, took us to the top of the leda clays and higher; to the level of the

saxicava sands (in our section), and higher still. From the summit we got a view of a vast and interesting horizon.

Allow me to recall to you the scene of that delightful day on the summit, and to photograph, not the glorious country in sight, but the Field-Naturalists' Club, for future reference. A hundred people and more, of scientific culture and occupation, resident at the Capital of the Dominion—including botanists, entomologists, geologists, palæontologists and other specialists of reputation and standing, ladies and children—with nets and collecting cases are grouped on the summit of a *roche moutonnée* and its adjacent slopes. They have come in omnibuses and buggies; and in ascending the mountain afoot they have learned each a pleasant lesson from the lips of Nature. Recall the freshness of those living truths, of which the biological leaders spoke; the pages of the first day of the creation which the geological leader told us how to read with our own eyes. Recall the company—the thoughtful men, the bright women and children, and tell me whether or not, having seen that picture, you believe the Capital of the Dominion, (now publishing its monthly scientific periodical, THE OTTAWA NATURALIST) has a respectable constituency of scientific men and women to-day? Ottawa is becoming more and more representative of the Dominion. Its scientific constituency has been organized; henceforth it has a more important duty to perform.

East, west and south the mountain overlooks a plain, which we saw in approaching Chelsea, was in large part a terrace, composed of leda clay. At Chelsea this is 270 feet above the sea; 150 feet above the Ottawa river, and 89 feet above the Ottawa Post Office.

Between Chelsea and Kingsmere we rose over hills of sand. About the level of Kingsmere a general upper level of the sand hills skirts the mountain on the southern and eastern side, as you will recall, and recognize by this sketch of the mountain as seen from Parliament Hill, Ottawa City. [Sketch on board—drawn in the form of a section —of the clays, sands and gravels from the level of the Gatineau river.]

I made it my business to trace afoot the upper surface of the sand hills, from Kingsmere to the south-eastern corner of the mountain,

and to ascend the mountain from Welch's farm where its upper surface in the sketch appears to be flat and level as seen from Ottawa City. My object in doing so was to ascertain first whether the sand hills constitute a true terrace; and further to ascertain whether the summit of the mountain was itself flat topped, by reason of the levelling influence of water.

The sand hills are composed of a clean yellow sand, very little intermixed with boulders. They are entirely of detrital origin of later age than the leda clays; and are simply higher members of the saxicava sands. The bench level above Welch's farm was found to be 680 feet above the sea, and on a general level with the sand hills nearest to Kingsmere.

That the Welch terrace is of marine origin, and a shore line of the pleistocene flood period, will be made clear to you by a little reflection. No marine fossils can be produced by me at this time, in support of the proposition, yet I can make it without reserve; because the mountain faces openly the wide expanse of plains which were at that comparatively recent date the enlarged gulf or inland sea of the St. Lawrence.

If further evidence be required I will refer you to Sir Wm. Logan's Geology of Canada, 1863, citing the elevations of marine clays along the shores of this inland sea, at Ha Ha Bay 600 feet above the sea, at Grenville 500 feet, and of similar clays skirting the hills all along its northern shore between Ha Ha Bay and the valley of the Ottawa. He cites saxicava sands at the falls of Bell River at 400 feet, at Beauport 350 feet, and on Montreal mountain 470 feet above the sea.

As the formation of clays on the one hand, and sands on the other, is dependant, however, upon local conditions, and is not a feature of succession in time, it is well to remember that the leda and saxicava shells can only be made use of as names for local, and limited portions of the section we are constructing. Clays, sands and gravels may alternate, and occur again and again throughout the series, according to drainage and lowest water level of the locality and time.

Next ascending from Welch's terrace to the summit of the flat topped mountain (seen NE of us from the summit of King's mountain) I found the elevation to be 910 feet above the sea;

very little lower than King's mountain. The general surface of the top proved to be nearly flat. It was strewn with loose and rounded boulders; clay and sand filling up the interstices between rocky parts, to a general even surface, more soil than rock. Did the water which undoubtedly made, and at the same time levelled Welch's terrace, rise 230 feet higher and level also the summit of the mountain, or was it ice that levelled and filled up its interstices? This question I would not undertake to decide, without abundant and conclusive evidence. Such it was not in my power to procure in a day's excursion. But the evidence as it stands, including the lines of the sketch, I think you will agree with me, is in favour of water. I do not remember having seen anywhere else the results of ice action displaying so nice a sense of the horizontal, upon a mountain top. According to the testimony of Mr. Welch (whatever it may be worth) clays and sands continued indefinitely northwards on the mountain along with the boulders, filling up and levelling up irregularities for many miles up the Gatineau valley at slightly increasing levels, until it assumed the character of a plain, rather than that of a mountain.

Not without interest in the same connection are the facts reported by New England geologists, and quoted by Sir Wm. Logan, in regard to the terraces fringing the mountainous region directly across the pleistocene sea of the St. Lawrence from Kings Mountain. At Ripton, Vermont there is a terrace 2196 ft. above the sea. At Lake Memphremagog are found clays 798 ft., and a terrace 1264 ft. above the sea. In the White Mountains Prof. Hitchcock reports terraces 2449, and 2665 ft. above the sea; and the list could be greatly extended. No marine fossils appear to have been found in any of these terraces. Is the negative evidence conclusive that they are not sea terraces?

September 17th the Club proceeded up the Gatineau valley to Kirk's Ferry, where the leda clays, themselves in the form of lofty hills and benches, picturesquely surround old hummocks and islands of Laurentian rock, the combination producing a novel and pleasing landscape. Mountain and terrace contrasting with terraced plains furnish many ideal landscapes along these shores of the glacial Laurentian gulf or sea, in this part of Canada. The clays of Kirk's Ferry appear to have been cut off from those of Chelsea by an intervening canon, but they

occur at the same level, and were doubtless formerly, or are still, continuous.

A little above Chelsea the clays are overlaid by a heavy wash of stream boulders representing the position of the Gatineau river during a later stage in its history. [Shown on section.]

October 22nd the last excursion of the season was made to the mouth of Green's Creek, five or six miles east of Ottawa, and to the sulphur springs, for the purpose of collecting fossils from the leda clays. You are already well acquainted with these; yet it is a pleasing realization of the flood period described, to see these still living inhabitants of the waters of Labrador and of Hudson's Bay imbedded in boulders now under the wheat fields of inland Ontario. I did not carry with me any barometers on this occasion, but estimated the average top of the terraces of the clay at the riverside 30 to 40 ft. above the summer stage of the Ottawa, or 160 feet above the sea; the sulphur springs, several miles up Green's Creek, at about the same height; the leda clays adjacent 50 ft higher; the overlying sands and interbedded clays of High Bluff 220 ft. above the sea. The latter were observed on another occasion spreading over the entire country at the head of Green's Creek; and farther throughout Carleton and Russell counties at about the same level—250 ft. above the sea—as far as Duncanville covering and forming the watershed between Ottawa City and Cornwall on the St. Lawrence; exhibiting in Russell county some of the best farming land of Ontario.

The width of the exposed sea bottom of the leda clays from King's mountain to Lake Champlain was greater than are now any of the Canadian lakes,—140 miles—and over, in many places.

I have drawn a longitudinal section of the St. Lawrence, including the Canadian lakes, on which are exhibited the elevations and relative positions with reference to the drainage outlet of the terraces, of the known surface of the inland sea of the St. Lawrence to which I have referred. [Shown on the wall.]

I will now ask you to accompany me farther inland toward that portion of the valley of the St. Lawrence which is at present filled by the great Canadian lakes. Let us inquire into the relation of the farms of the salt water region hereabouts, to those of the freshwater region surrounding these lakes.

The extension inland of the pleistocene gulf or sea of the St. Lawrence is the first thought to suggest itself. But how far up did the salt water extend? is the question. Marine fossils collected, and reported by Sir William Logan and his assistants, proved the extension as far as the Archæan peninsula, or isthmus which extended from the Chats Rapids, on the Ottawa River 25 miles above Ottawa, to Kingston in the direction of the Adirondacks. Beyond this ridge is the valley of the great lakes of the St. Lawrence into which I am not aware any evidence has been produced of the presence of the waters of the sea. I spent Sunday, November 6th, in repeating a former excursion of the Club which I did not accompany to the Chats Rapids, with a view to studying the character of this ancient ridge, or peninsula, where it is crossed by the Ottawa River. At Quyon, on the left bank, travelling northwards I rose over 100 ft. in 2½ miles to the level of a flat wide plain, which extended up the river, past the Chats Rapids to Shawville 14 miles, and to Clark's 7 miles beyond Quyon.

At Quyon, Shawville, and Clark's the saxicava sands were seen overlaid by heavy gravel deposits of a river formation of the pleistocene. Marine fossils have indeed been reported by Sir William Logan as far up the Ottawa valley as Lake Coulonge, 80 miles above Ottawa City; and I think Mr. Ami can tell you of localities beyond that, which have furnished the characteristic fossils of Green's Creek.

There was a peculiarity at Quyon, however, which is worthy of mention—the hummocky surface of the leda clays, produced by glacial action. The ice action was plainly later than the clay deposits; consequently it had nothing to do with the waters which deposited the clays.

On the line of the Canada Pacific from Carleton Junction to Peterborough, where I crossed the Archæan peninsula, during my recent holiday vacation, glacial action on a great scale was again observed, following a line evidently having a relation to this ancient peninsula. There were smooth and level, or slightly rolling forms; then suddenly the characteristic pinnacles of Waterloo county, less developed than in Waterloo, but accompanied, or perhaps replaced, a little further east by the characteristic smaller glacial hummocks of Quyon. As ocular evidence of this glacial action I will direct your

attention to Rand & McNally's new map of Canada [exhibited] where the nests of lakes tell the story better than I can. I have drawn two lines on it including the region of these lakes—which is seen to be a little above, and westward of the Cambro-Silurian beach on the Geological Survey map.

The railway levels of the Toronto Canada Pacific branch, crossing the belt from west to east, show a gradual descent, at a low elevation above the sea, from Tweed in the valley of the Moira River 324 ft., to Perth station in the valley of the Rideau 184 ft. above the sea. There is a summit between, 20 miles east of Sharbot Lake, in the middle of the lake belt, 505 ft. above the sea.

This summit is distant from Welch's terrace on Kings mountain 60 miles in a direct line; and its elevation is 160 ft. lower than the terrace. The railway levels are from the section of the old Ontario and Quebec, now Canada Pacific Railway; my own elevation of Welch's terrace was obtained by means of two good aneroid barometers read at Hull station 185 ft. above the sea, at Kings mountain, and again at Hull the same day on returning,—so as to eliminate at once the weather, and any instrumental irregularities.

Now let us take the train to Brockville, and examine what the valley of the St. Lawrence has to tell of the connection between the pleistocene salt water sea, and the valley of the great Canadian lakes. The Geological Survey reports have so fully described the country of the Archæan neck below Kingston, that I need not recall many points. Kingston at the foot of Lake Ontario is 246 ft. above the sea, as shown on my section. All the surrounding country is low and level. The leda clays are visible at many points along the St. Lawrence, between Kingston and Brockville, either on the Canadian or the American side. To make a long story short the condition of things is precisely that described at Quyon. To this I have to make the exception of the fact that marine fossils have not been found in these clays above Brockville as they are above Quyon. That these clays are continuous with the valley of the great lakes, and are identical with the lake region clays, I can simply state on the authority of Mr. G. K. Gilbert who has made a study of this region, and of the pleistocene outlet of Lake Ontario in the State of New York, including the localities under consideration.

You will observe that I have paid more particular attention to the higher levels of the flood period, or the plestiocene drainage, than to the pliocene, or later tertiary drainage, when our humble but interesting ancestors must have already spread themselves by their characteristic enterprise, over all the "known and unknown" parts of the temperate latitudes of the globe. The great valley of the St. Lawrence which is now filled by Lakes Ontario, Erie, Huron and Superior undoubtedly existed in the Pliocene tertiary, that is, before the advent of the flood period. It must also have had an outlet.

The confluent ice body into which the ice streams developed at the period of extreme precipatation and cold ended southwards in Pennsylvania and Ohio as is delineated by H. Carville Lewis, of the Pennsylvania Geological Survey, (Report 2 in 1884).

Necessarily great river valleys existed before the advent of the ice streams, and of the confluent ice body referred to. They were at first followed by them; but finally in many instances they were filled up and altered in course by the debris of the glaciers; and neatly plastered over, and hidden beyond suspicion, by the loaming clays of the happy Canadian farmer. These ancient rivers of the preceding (tertiary) epoch had already cut down deep into the Cambro-Silurian bed rock; for this country had been untold ages out of water. You cannot go to the Chats Rapids, and to the Grenville and Lachine rapids, and point to to the exposed bed rock in evidence of the depth of the former erosion, because the ancient streams, as is well known, have been diverted in many well known cases.

Suppose this country to be raised 1,000 feet higher above the sea, and new streams to have dug down until they unearthed the old ones, in patches and remnants; these filled with gold to tempt the miner to a frenzy of investigation, and you will have before you the conditions of the mining industry of surface geology on the Pacific Coast. Every body in that school becomes a geologist by profession. The Chinaman and the white man together become experts, because their fortune depends upon their reading nature skilfully and correctly.

In reading the record of the boulder clays and of the leda clays of this country we read the history of its former rivers, and naturally of its inhabitants, its vegetable and animal life, the kinds that existed before the flood of our own most ancient and interesting tradition.

If you ask what else the gravels and clays can tell us that we may read for ourselves, I can mention then besides the arctic leda and saxicava shells, and the Hudson Bay fish of Green's Creek, belonging to the flood period referred to, the leaves and woods and mammalian bones of the more ancient rivers to which I have referred as generally buried out of sight by the boulder clays and the leda clays. The upper courses of all these ancient streams were necessarily higher, and in many places the debris which filled them must have been since exposed; sometimes accidentally, as in connection with coal mining in Pennsylvania; in wells and borings, for coal oil, or salt, or other minerals. Exposures may exist where our eyes have not learned to read them. As you know, a milder climate than the present preceded the cold period and its flood phenomena. So it was on the Pacific Coast, in Greenland, and generally in northern America and Europe during the middle and later tertiary.

River gravels of pliocene age ante-dating the present mammalian creation—the genus *homo* only excepted—have been abundantly exposed and identified in the auriferous gravels of the Pacific Coast. They are filled up river valleys like ours, which have been re-excavated by natural operations, and sifted by men in quest of gold with a thoroughness no other quest could ever have accomplished. During the years 1869, 1870, 1871, it was my lot to be engaged in their study, in connection with the Geological Survey of California. Leaves, woods, mammalian bones and human relics, consisting of implements and bones were industriously collected. The plant life was thoroughly studied, and reported on by Leo Lesquereux who stands at the head of the vegetable biologists. Their pliocene age has been established, and the facts have been accessible to all men in published form—have lain, in fact, in the public libraries of Ottawa for a dozen years. An article in the *Overland Monthly*, written by myself about 1873, which described a prolific find of mortars and pestles in a mountain of basalt covered gravel, with a precision not to be escaped from, had a wide popular circulation and has slept on the shelves of a hundred libraries.

To generous Louis Agassiz, and to the circumstance of his visiting the Pacific Coast at that time, the world is indebted for the machinery

of publication* which has worked a change in the scientific world; formerly unwilling, now it is ready to accept these facts. Arthur Wallace, returning from a recent visit to the Pacific Coast, writes, regarding these finds of human remains in the pliocene tertiary river valleys of the Pacific Coast, that so far from being improbable, and strange, the non-existence of such remains in the pliocene period would be far more remarkable, improbable and strange, in the light of to-day.

For further information on the pre-glacial drainage of Lake Ontario I refer you to the observations of J. W. Spencer, formerly of Hamilton, and of the Geological Survey of Canada, published by the Philosophical Society of Washington, 1881. Mr. Spencer has presented many facts that are interesting on the pliocene erosion, or former valley of the lakes, in the region within reach from Hamilton; and also on the connection of the valleys of the Mississippi region where he is at present located.

It remains for me to trace a little further, and to review the facts regarding the pleistocene period, not of erosions or deep cut valleys, but of flood, and filling up of the ancient valleys; of terraces, and of plains to which we owe so much that is beautiful in the wide "level and rolling" expanse which is the paradise of the Canadian farmer. The subject goes beyond my capacity; the poet and the artist must do justice to this favored land of lakes, of rich agricultural soil, and of maple forest, that was only yesterday the bottom of a shallow sea. I have seen many countries, and frankly, I do not believe that nature —intent on rearing a vigorous race—in all the world has given its children another like it.

Probably a majority of the persons present who have followed the line of facts presented, will have drawn their own conclusions, in advance of what I shall say. If my facts are to be trusted, the evidence seems pretty conclusive that the sea penetrated into, and occupied the valley of the great lakes for a time at least during the pleistocene epoch. It is not my business or purpose at present to account for the absence of marine fossils in the valley of the St. Lawrence above

*Whitney's Auriferous Gravels, in Memoirs of the Museum of Comparative Zoölogy, Cambridge, 1880.

Brockville, while they have been found up the Ottawa in position and elevation corresponding to Lake Ontario.

Having climbed Mount Washington I will say that I cannot conceive of any terraces on the flanks at any latitude like 2,665 feet, as reported by Prof. Hitchcock, of any other origin than that of sea terraces. A different conclusion could be arrived at on the hypothesis of a recent change of level, whereby the region of the four great lakes could be supposed to have been depressed. But I have described to you the Ottawa leda clay terraces as extending northward beyond the Archæan neck, which has been reared as a dividing line between salt water, and the fresh waters of the pleistocene epoch. I have shown that the ice phenomena of that region are superficial, and later than the clays; that a separating ridge in the sixty miles between Kings Mountain and Sharbot Lake, by reason of change of level, is untenable; while the continuity of the St. Lawrence River and Ontario Lake shore clays confirm these facts. If by levelling along the terraces, a change of level can be shown to have occurred the facts I have given will still remain to be disposed of. Such levels have been taken by Messrs. Gilbert and Upham, on both sides of the American boundary line. In spite of the difficulty of identification of terraces they may readily establish important points connected with the pleistocene history of the lakes.

But if you would exclude the salt water sea of the lower St. Lawrence from the one great fresh water lake which united the areas of the four Canadian lakes another material must be produced that could do it other than ridges or soil of the surface. An ice dam has been suggested. It would have lain along the region of the belt of little lakes and glacial hummocks described between the Chats Rapids and Kingston. I have yet to hear from any one who has ever seen such an ice dam, in any of the icy regions of the globe. It must have been more than an ice dam; an ice stream which had the effect of a dam. A concentrated ice stream flowing in the direction of the united upper Gatineau, Coulonge and upper Ottawa rivers might well have filled the gap between King's mountain and the Adirondacks—and so replenished the melting action of warmer water, against which diminishing influence no other ice dam could have maintained itself. Such an ice dam—or

ice jam, I beg leave to amend—would account satisfactorily for the absence of marine fossils in the lake region.

It would not alter the fact of the flooding of the lake region in the period of the leda clays, the same as if such ice dam had not had any existence. If such ice dam existed, it was toward the close of the flood period, and only after the clays I have described had been laid down along the old river valleys, and over all the lower places.

In regard to the shore lines and terraces of the huge shallow St. Lawrence sea or lake which united the four Canadian lakes during the pleistocene epoch, on the sides toward Hudson Bay and Winnipeg Lake respectively, where ice dams also would appear to have been necessary to exclude salt water, Dr. Bell and Mr. Lawson, who have worked in those regions, Dr. Dawson who has studied the country beyond, and others will probably be able to contribute many more interesting facts, the mere statement of which may carry their own explanation with them

Second.—On Thursday, the 5th January, Mr. Amos Bowman, of the Geological Survey Staff, explained the significance of the clays, sands and gravels of this district, and drew especial attention to their mode of occurrence at the localities visited by the Club Excursions. By means of a longitudinal section of the valley of the St. Lawrence, including the Great Lakes, and a map marked with blue outlines, he showed the widest expansion, and greatest elevation which the waters of this great basin attained in the Pleistocene period. Diagrams were also drawn on the blackboard showing the relations of the clays and sands to the gravel deposits formed by the rivers when these ran at corresponding elevations. The level of the Welch terrace, on the side of the mountain, near Chelsea, was shown by the section to over-top the hills of Ontario, and to intersect the grade of the St. Lawrence at Sault Ste. Marie. The paper, which was highly appreciated by all present, will be found in the present number.

Mr. H. B. Small said that he had listened with very much pleasure to the lecture, which had presented to the members in a very clear manner the very important subject treated of. It seemed to him especially a proof of the great value of the Club outings, as a means of elucidating such lectures, for if the localities referred to by Mr. Bowman had not been visited by the members, it would have been impossible for them to have so fully realized the character and extent of the deposits in question. Mr. Stewart stated that he had seen in Madoc nodules, obtained from Deer Creek, in the County of Hastings, which exactly resembled those obtained from Green's Creek, near Ottawa, but that not having had an opportunity of opening these nodules he could not say whether they actually contained fossils. In reply to a question by Mr. R. B. Whyte as to whether the boulders, which occur in large numbers between the Ottawa River and the Chelsea Mountains were deposited by glaciers, Mr. Bowman explained that ice was the only known agent for the transportation of such masses. Mr. Ami made some remarks as to the evidence of glacial action in certain localities mentioned, and to the deposition of certain deposits of gravel at Brittania, but owing to the late hour the discussion was not prolonged.

THIRD.—Prof. Macoun delivered, on Thursday, the 19th January, an address on "Our Forest Trees," considered both from the geological records, and from their present occurrence. The concluding portion of the address, calling attention to the enormous annual waste of our forests, due to careless lumbering, and frequent bush fires, appealed especially to the audience, for at Ottawa people have continual evidences of this destruction presented to them.

With reference to the lecturer's theory that our trees originated in the north and had been gradually pressed southward by the increasing cold of their original habitat, the Rev. Prof. Marsan asked why more species of trees were not now found in Europe, where the climate more nearly resembles that of the Tertiary period, than in Canada. In reply Prof. Macoun explained that the area of Europe had once been much greater, but owing to subsidence large tracts had been covered by the sea, and with the increasing cold the trees were driven seaward and finally became extinct, whereas on the American continent the species had an uninterrupted retreat southward. Mr. Ami made some interesting remarks on the cretaceous formations discovered by Dr. Dawson in British Columbia, and the great forests and animals of which they give evidence, and which show the same agreement with the flora and fauna of Japan at that time, as the present forests of that country do to those of America as pointed out by the lecturer. Prof. Macoun mentioned that at that remote time the Rocky Mountains had not yet been upheaved, and that a vast plain—more or less undulating and broken—stretched from the Laurentides to the Pacific, and probably even to Japan. Mr. George Holland did not think that the citizens of Ottawa could be accused of indifference in regard to the action of the mill-owners in filling the river with sawdust, as they had no means of preventing it. In the destruction of our forests there was a race between the lumberman and the settler, and by much the greater damage was done by the latter. He was obliged under the laws of the Province from which he obtained his land to destroy a certain quantity of the forest on penalty of eviction, and in his anxiety and endeavour to do so, more of the forest was destroyed in one year by fire, than would be cut down in a decade by the lumberman whose interest it was to conserve his limits. Mr. H. B. Small desired to thank the lecturer for the

vigorous notes of alarm he had sounded. It was a lamentable fact that but few remnants of the vast virgin forests could now be found. There had been at Casselman a considerable area untouched, but this was now fast being destroyed. There remained a section of original forest in Ontario upon the head waters of the Petewawa, Madawaska and Muskoka rivers, which it had been proposed to set apart as a Provincial Park, for the conservation of the forest and also of the larger animals which are so rapidly being exterminated. He had much pleasure in moving a vote of thanks to Prof. Macoun for his valuable address. Mr. Ballantyne, in seconding the vote of thanks, referred to the economic questions which had been brought forward, and to the action taken by the Ontario Government toward ascertaining the best methods for preserving and replanting the forest areas. Rev. Prof. Marsan asked why they did not avail themselves of the experience of other countries in this direction, instead of spending so much time in such investigations as had just been mentioned, while there was a continual destruction going on, the effects of which could never be remedied. Of minerals there was an inexhaustible store, so that waste of them did not so greatly matter, but the vegetable and animal supplies for man's use were limited, and being under his control should be carefully preserved for the requirements of the future.

Mr. J. Stewart read a brief paper giving a synopsis of geological work performed during the past summer by Mr. W. R. Billings, Mr. T. W. E. Sowter and himself in various localities. Several new genera and species of Crinoids, etc., had been discovered, as well as many additions to the published list of fossils for this district. In reply to a question by Mr. H. B. Small regarding the opening of clay nodules, Mr. Stewart explained the method of alternate boiling and freezing adopted by him. Mr. Ami stated that he had also found this plan very effectual, and that in some cases the splitting occurred during the act of boiling.

Mr. Ami then read some notes on his examination of the New Edinburgh exposures of the Utica, accompanied by a list of the species collected from these very fossiliferous rocks, indicating those new to the Club lists.

ON UTICA FOSSILS FROM RIDEAU, OTTAWA, ONT.

By Henry M. Ami, M.A., F.G.S.

(*Read 19th January, 1888.*)

As a natural consequence of the recent annexation of the vice-regal suburb of New Edinburgh, or Rideau, to the municipality of Ottawa, this new ward has had extensive operations performed within its limits during the past summer. Rideau, for the most part, exhibits throughout its entire area the bare strata of the Utica and Trenton formations, seeing that the newer Post-Tertiaries have been almost completely swept away and denuded in times subsequent to the deposition of the "boulder clays," "Leda clay" and "Saxicava sands," which at some period covered the valley of the Rideau River. An extensive series of trenches were opened and a system of pipes laid for water supply in the various streets, to such an extent that an excellent opportunity was afforded the members of the Ottawa Field-Naturalists' Club and others of examining not only the stratigraphy of the rocks occurring there, but also of making collections in the highly fossiliferous measures brought to view and of obtaining not a few fossils of rare occurrence, many of which have proved new to the locality and a few new to science. These latter, it is hoped, will shortly be described, and communicated at one of the Club's Soirées.

Detailed sections of the strata were obtained at various points along Crichton Street and elsewhere, and these may prove valuable for both palæontological and stratigraphical purposes. In order to give satisfactory notes on the distribution of the fossils of the Utica here as in other quarters, it is deemed advisable to insert these sections, giving the sequence of strata and the precise horizon at which most of the species mentioned in the lists to be given hereafter properly belong. In the description of the strata, their lithological character as well as the thickness of the beds and the fossil remains entombed within them and so well preserved, are given in more or less detail according as the facts were presented to the writer in the field work.

SECTION OF UTICA ALONG CRICHTON STREET, RIDEAU.

STRATA HORIZONTAL—IN DESENDING ORDER.

Superficial deposits, road metal, &c. (RECENT).	4 inches.
UTICA FORMATION.	
Band of impure nodular argillaceous limestone belonging to the Utica formation.	Impure limestone, 3 inches.
Series of thin and soft brittle shaly strata, with occasional rounded concretionary masses of various sizes distributed in the softer material.	Soft, brittle shales, 14 inches.
Band composed almost exclusively of impure nodular limestone, arranged in irregular masses separated by shaly or argillaceous material.	Impure limestone, 8 inches.
Shaly strata, apparently destitute of nodular or concretionary masses, cleavage planes in the shales at right angles to the planes of stratification.	Shales, 11½ inches.
Band of partially disintegrated nodular limestone.	limestone, 6 inches.
Series of very soft earthy strata, most probably shaly at one time, but deprived of its cementing materials.	Soft, earthy strata, 10½ inches.
Band of dark-grey, hard, compact, impure limestone, not so bituminous as beds in lower part of this section, nodular and concretionary in certain portions which are probably so disintegrated as to point out the lines of conchoidal fracture in which the beds would break. Rhombohedra of calcite are rather abundant in numerous veins. Bed holding *Asaphus Canadensis*, Chapman; *Triarthrus Becki*, Green *Leptæna sericea*, Sby; *Orthis testudinaria* Dalman; *Leptobolus* and *Lingula*, &c.	Impure limestone, 6 inches.
Dark brittle and bituminous shales, very thin and fissile, holding abundant remains of the ubiquitous shell *Leptæna sericea*, Sowerby.	Brittle shales, 3 inches.
Band of light-weathering, dark, bituminous limestone, in which were found the remains of *Bucania expansa*, Hall, and *Leptæna sericea*, Sowerby (a rugose variety of the latter).	Bituminous limestone, 10½ in., (*plus*).
NOTE.—Proceeding in a northerly direction, along the same street, the above bed, of which only ten and a half inches are exposed at the bottom of the trench where the section was taken, may be seen to crop out on the surface of the ground, opposite house No. 101, where the following section was observed:	
Additional *five* inches of dark, impure, bituminous limestone similar to above, disintegrating in certain portions of the band.	5 inches.
Hard, compact, dark, impure, bituminous shales or shaly limestone, holding abundant fossil remains: *O. testudinaria*, Dalman; *Leptæna sericea*, Sowerby; *Endoceras Proteiforme*, Hall, &c., &c.	Imp. shales or limestone, 2 ft. 1 in.
Series of black, bituminous shales teeming with fossils, typical of the Utica formation: *Leptæna sericea*, Sowerby; *Strophomena alternata*, Conrad; *Orthis testudinaria*, Dalman; *Zygospira Headi*, Billings; *Lyrodesma pulchellum*, Hall; *Endoceras Proteiforme*, Hall; *Asaphus Canadensis*, Chapman, &c., &c. (base of section).	Bituminous shales, 4 inches, (*plus*).

Between the *stratum* last mentioned (*supra*) and the next mentioned, there are a few inches of bituminous limestones and shales which connect them without break, and the section is thus continued in descending order:

Dark, impure, bituminous limestone band, holding *Leptæna sericea*, Sowerby; and other fossil remains.	Bituminous limestone, 9 inches.
Soft, friable, purplish black, disintegrating, fossiliferous shales—very characteristic in its mode of occurrence and distributed in other portions of Ottawa City and elsewhere—holding abundance of white weathering fossil remains, amongst which were recognized: *Orthis testudinaria*, Dalman; *Leptæna sericea*, Sowerby, and *Asaphus Canadensis*, Chapman.	Soft, friable *shales*, 8 inches.
Band of unevenly bedded, impure, bituminous limestone with *Asaphus Canadensis* and *Orthis testudinaria*.	unevenly bedded limestone, 7 inches.
Soft, friable shales, holding abundance of fossils; very similar to and evidently deposited under exactly similar conditions as the one-and-a-half inch band below: *Leptæna sericea*, Sowerby, and varieties with elongate-mucronate lateral extremities, also *Orthis testudinaria*, Dalman, are present in large numbers.	Soft, friable shales, $2\frac{3}{4}$ inches.
Band of light-gray, impure limestone, bituminous, and holding: *Orthis testudinaria*, Dalman; *Leptæna sericea*, Sowerby; *Conularia Trentonensis*.	Bituminous limestone, 4 inches.
Thin, irregular and unevenly bedded, soft, friable, earthy shales, disintegrating rapidly, when exposed, and teeming with fossil remains. These fossils often appear on the unearthed surfaces white in colour on the brownish-gray shales. *Orthis testudinaria*, Dalman, and *Leptæna sericea*, Sowerby, seem to be the two forms most prevalent, and are often so preserved as to show characteristic internal and external markings.	Soft, earthy shales, $1\frac{1}{2}$ inches.
Black, bituminous, impure limestone band, with *Leptæna sericea*, Sowerby; *Orthis emacerata*, Meek, and *Asaphus Canadensis*, Chapman.	Bituminous limestone, 8 inches.
Black and bituminous shales, holding abundance of organic remains, especially those of the characteristic *Asaphus Canadensis*, Chapman, of which the numbers present are exceedingly great.	Bituminous shales, 14 inches.
Band of impure, highly bituminous limestone, yielding a strong odour of petroleum, when struck with a hammer; black in colour, with irregular, sharp, splintery and conchoidal fractures, in which occur the remains of *Asaphus Canadensis*, Chapman; *Strophomena alternata*, Conrad, &c.	Impure, bituminous limestone, 11 inches.
Black, bituminous and somewhat splintery brittle shales, holding the following fossils: *Leptograptus flaccidus*, Hall; (?) *Sagenella ambigua*, Walcott; *Leptobolus insignis*, Hall; *Schizocrania filosa*, Hall; *Leptæna sericea*, Sowerby; *Conularia Trentonensis*, Hall; *Endoceras Proteiforme, var tenuistriatum*, Hall; *Asaphus Canadensis*, Chapman; *Leperditia*, sp. allied to *L. cylindrica*, Hall.	Bituminous shales, 7 inches.

These sections taken together give a total thickness of *fourteen feet ten inches*, so far as examined in 'Rideau,' which, with the fair

allowance of a few inches of strata, which may be styled passage-beds or beds of transition, constitute the lowest portion of the Utica formation, as it is developed at Rideau, where it overlies, perfectly conformably, the black, nodular and impure bituminous limestones of the Trenton formation, which begins immediately below these sections, and which at the northern end of Crichton street are clearly observed as thick bedded limestones, characterised by the presence of *Murchisonia bellicincta*, Hall, *Strophomena alternata*, Conrad, *Leptæna sericea*, Sowerby, monticuliporoid corals, (probably *Prasopora Selwyni*, Nicholson), etc., all eminently Trenton in *facies*.

From these beds of the Utica formation in Rideau the following species of fossils were obtained during the summer of 1887, which illustrate the palæontology of the rocks in question and indicate the fauna which swarmed in the old Ordovician or Cambro-Silurian sea about Ottawa.

I. Rhabdophora :

1. Leptograptus flaccidus, Hall.
2. Orthograptus quadribrachiatus, Hall.†
3. ? ? Sagenella ambigua, Walcott.

II. Polyzoa :

4. Helopora sp.*
5. Batostoma erraticum, Ulrich.

III. Brachiopoda :

6. Lingula obtusa, Hall.
7. " Cobourgensis, Billings.
8. " Daphne, Billings.
9. Leptobolus insignis, Hall,
10. Leptæna sericea, Sowerby.
11. Strophomena alternata, Conrad.
12. Orthis bella-rugosa, Hall.
12. " testudinaria, Dalman.
14. " emacerata, Meek.
15. " sp (cf. O. pectinella, Conrad.)
16. Zygospira Headi, Billings.

IV. Lamellibranchiata :

17. Ambonychia sp. nov.*
18. Modiolopsis curta, Hall.*
19. " anodontoides, Conrad.*
20. Lyrodesma pulchellum, Hall.

V. Pteropoda :

21. Conularia Trentonensis, Hall.

VI. Gasteropoda :

22. Bellerophon bilobatus, Sowerby.
23. Bucania expansa, Hall.
24. Pleurotomaria subconica, Hall.
25. Metoptoma n. sp.

VII. Cephalopoda :

26. Endoceras proteiforme, Hall (type).
27. " " var. tenuistriatum, Hall.
28. Trocholites ammonius, Conrad.

VIII. Crustacea :

29. Triarthrus Becki, Green.
30. Asaphus megistos, Locke (=Isotelus gigas, Dekay.) *vel* platycephalus, Stokes.
31. " Canadensis, Chapman.
32. Calymene senaria, Conrad.

IX. Annelida :

33. Serpulites dissolutus, Billings, var.

X. Ostracoda :

34. Leperditia cylindrica, Hall.
35. " minutissima, Hall.

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† Also a species of Diplograptus besides other obscure forms.

* Species marked with an asterisk are new to this locality.

NOTES ON GEOLOGICAL WORK DURING THE SUMMER OF 1887.

Mr. John Stewart.

(*Read 19th January, 1888.*)

During the past season, from May to September, the following places were visited by W. R. Billings, T. W. E. Sowter, and myself, and in addition to these, individual outings were made :—

Hull, May 14th, 19th, 24th, June 29th, July 1st, August 27th ; New Edinburgh, May 21st, 24th, 28th, June 25th, July 9th, 23rd, September 17th ; Aylmer, June 9th, 21st, July 1st ; Hogsback, July 2nd ; Division Street, May 29th, June 29th, July 17th, 24th, August 7th, 14th, 21st ; Mount Sherwood, June 5th, 26th ; Little Chaudiere, Sept. 24th ; Paquette's Rapids, September 5th to 12th.

To avoid repetition, it is not considered necessary to mention all specimens found during these pleasant trips, but only such as are new, either to the locality, or to the formation under which they are mentioned, or to science, although many interesting, beautiful and instructive finds were made in addition to the following :—

TRENTON FORMATION.

Crinoids.	Locality.
Taxocrinus, N. Sp.	Hull.
Carabocrinus, N. Sp.	Division Street.
Anomalocrinus, ? N. Sp.	Hull.
One species each of two new genera of Crinoids.	Hull.

Blastoids.

A species of a new genus of Blastoids.	Division Street.

Gasteropods.

Fusispira terebriformis.	Hull.
Metoptoma erato.	Hull.

Brachiopods.	Locality.
Camerella panderi	Hull.
Lingula riciniformis	Hull.
do kingstonensis	Hull.
Orthis borealis	Division Street.
Orthis pectinella	Division Street.
Orthis plicatella	Between G and H, Con. C, Nepean.

UTICA FORMATION

Brachiopods.

Lingula cobourgensis	New Edinburgh.
Strophomena camerata ? or Imbrex ?	New Edinburgh.

POST TERTIARY.

Nodules containing the following new species have been obtained from Green's Creek and Ottawa River :—

3 Starfish, 1 Leaf, 1 Small plant.

CHAZY FORMATION.

Several undetermined species of Lophospira, Scalites, Ctenodonta, Lingula, Rhynchonella and Leperditia, which Mr. Sowter is now studying.	Hogsback and Aylmer.

Mr. Billings, Mr. Sowter and myself have had the honor of sending to Professor Charles Wachsmuth of Burlington, Iowa, specimens of Crinoids from our collections for purposes of illustration in the valuable monograph on the Palæocrinoidæ of North America which he is engaged in writing. This is a loss to the literature of the Club, as these new species and genera would under other circumstances have been described by Mr. W. R. Billings. The trip to Paquette's Rapids from September 5th to 12th was a much enjoyed period of the season's work, and although outside the ordinary limit of the Club's field of operations, this section of workers considers that the enlargement of the scene to include this favored spot, on account of the exceedingly beautiful specimens obtained there,—if for no other reason, and there are many others —would be a step in the right direction.

REPORT OF THE GEOLOGICAL BRANCH FOR THE SEASON OF 1887.

To the Council of the Ottawa Field-Naturalists' Club :

In presenting this the seventh annual Report of the Geological Branch of the Club, the leaders have much pleasure in stating that a continued and increasing activity has characterized the past season's work, and that in many instances rare and interesting discoveries have been made in the strata of rocks so developed in and about Ottawa. This region, in which there has been a considerable number of workers in geology for years past, nevertheless contains abundance of material as yet unfound, and only awaiting the keen and observant eyes of the members of this Club.

As years go on this branch of the Club's work appears to develope more and more, so that whilst a goodly number of our members are actively engaged in working up the "Geology of Ottawa" in its interesting details, the field is so vast and the materials so plentiful and near at hand that there is room for a small army of geologists, such as our city, from its natural position, could well produce, all of whom would find ample scope for specialties in different lines of enquiry.

Appointed by your Council, last spring, to lead the various parties interested in geology at the excursions and sub-excursions of the Club, your leaders have striven to do their utmost in furthering the aims of the Club in this direction, so that scarcely a single one of these excursions was undertaken and conducted without one or other of the leaders being present.

Certain years often present advantages for working up definite formations, and whilst the season of 1886 was particularly favorable to the students of the Post-Tertiary, from the fact that the streets of our city were excavated to depths ranging from eleven to eighteen feet for sewage purposes, thereby exhibiting the glacial and post-glacial deposits, the season of 1887 has seen the vice-regal ward opened up and cut through to a considerable depth, exposing in a beautiful manner the perfectly conformable contact of the Utica and the Trenton formations. The former consisting of bituminous shales and alternating limestones, is replete with exquisitely preserved fossil remains, many of which were collected and proved new to this locality.

From the 7th of May to the 18th of November, inclusive, *i. e.* from the time when the ground was first rid of its proximate winter covering to the time when a few inches of snow had already fallen, sub-excursions and excursions were held to various objective points. On such occasions, the leader who happened to be present usually addressed the members, giving in a general way the summary of the day's outing and results in geology. These have already been reported upon in the OTTAWA NATURALIST, which each member has received every month.

It is gratifying to record that during the past season ladies interested in geology joined the geological section, and were at various outings, and actively engaged in collecting specimens.

On several occasions members had the pleasure of going out on excursions or sub-excursions with distinguished men, non-residents of Ottawa, actively engaged in geological research. This year Mr. G. F. Matthew, of St. John, N.B., Prof. L. W. Bailey, of the University of New Brunswick, Fredericton, and Mr. N. Saint Cyr, of the Department of Public Instruction, Quebec, were amongst those who visited us, and were shown to places of interest where collections were made and named by one of the members.

In this year's report it has been deemed advisable not to publish the results of the season's work under the various formations, notwithstanding the undoubted usefulness of that scheme, but in the form of "Notes," or contributions to THE NATURALIST, and to be read at the winter soirées by the individual workers.

In conclusion, the leaders are confident, judging from the very encouraging season's work just closed, that there is every prospect of progress in the elucidating in the years to come of the various formations about Ottawa. The want of a good topographical map, however, has long been felt, and if there were such a one the geological boundaries of the various formations as known at present could be laid down, with a view to forming a basis for further study, as this region is considerably faulted and disturbed at many points which are of great interest.

January, 1888.

HENRY M. AMI,
C. F. MARSAN, O.M.I.,
JOHN STEWART,
} *Leaders.*

* Abstract of Meteorological Statistics at Ottawa, June 1886 to May 1887, inclusive.

	Months.												
	1886.							1887.					Year.
	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	
Average height of barometer at 32° and reduced to sea level	29·908	29·887	29·925	30·045	30·134	29·909	30·106	29·982	30·171	29·975	29·974	30·016	30·003
Highest barometer	30·183	30·186	30·277	30·454	30·589	30·460	30·716	30·746	30·892	30·917	30·622	30·298	30·917
Lowest barometer	29·368	29·691	29·638	29·608	29·329	28·996	29·200	29·235	29·068	29·376	29·193	29·577	28·996
Monthly annual ranges	0·815	0·495	0·639	0·846	1·260	1·464	1·516	1·511	1·824	1·541	1·429	0·721	1·921
	°	°	°	°	°	°	°	°	°	°	°	°	°
Average temperature of the air	62·64	67.14	65·19	56·15	45·81	31·61	10·66	4.33	11·74	17·16	34·14	62·62	39·10
Difference from average (12 years)	−3·23	−2·27	−2·05	−1·77	+0·53	+2·03	−2·87	−5·92	+0·94	−4·62	−4·28	+7·24	−1·44
Highest temperature	76·5	89·1	85·6	85·4	75·5	65·2	33·3	38·4	41·9	36·3	59·2	89·6	89·6
Lowest temperature	40·2	44·0	46·2	30·0	20·3	−0·1	−22·3	−31·6	−17·2	−13·2	−2·8	34·3	−31·6
Monthly range	36·3	45·1	39·4	55·4	55·2	65·3	60·6	70·0	59·1	49·5	62·0	55·3	121·2
Average maximum temperature	69·10	73·95	72·85	65·17	56·34	38·20	19·38	15·97	22·13	26·42	42·55	74·57	.....
" minimum temperature	51·65	55·94	55·09	46·33	35·27	23·37	1·75	−7·71	1·28	8·84	24·21	47·97	.....
" daily range	17·45	18·01	17·74	18·84	21·07	14·83	17·63	23·68	20·85	17·58	18·34	26·60	19·38
Average pressure of vapour	0.455	0·518	0·498	0·379	0·261	0·153	0·076	0·064	0·081	0·098	0·174	0·374	0·261
Average humidity of the air	80	79	80	82	80	83	89	90	94	94	86	66	84
" temperature of the dew point	56·4	60·0	58·9	51·3	41·4	28.0	12·7	8·7	13·7	18·0	31·0	51·0	41·4
Amount of rain in inches	2·11	6·77	3·47	3·99	1·79	0.35	R	0·25	0·00	0·60	2·88	0·39	23·00
Difference from average 12 years)	+0·91	+4·13	+1·35	+0·96	−0·75	−0·96	−0·66	−0·39	−0·56	−0·95	+1·78	−2·33	+2·62
Number of days of rain	15	17	11	17	11	4	1	1	0	0	7	4	88
Amount of snow in inches	.....	.....	.....	.....	S	14·7	25·5	38·5	67·2	36·0	0·5	.....	182·4
Difference from Average (12 years)	.....	.....	.....	.....	−1·4	+4.2	−27·2	+15·4	+48·2	+19·4	−6·7	.....	+52·0
Number of days of snow	.....	.....	.....	.....	2	11	10	15	11	9	1	.....	59
Percentage of sky clouded	60	43	45	47	50	76	59	61	58	46	43	41	51
Average velocity of wind	4·44	3·90	3·47	4·22	4·86	6·94	4·53	5·62	7·35	7·44	5.03	3·81	5·14
Auroras	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

* Note.—This Abstract has been kindly furnished by Prof. Carpmael, Director of the Meteorological Service of Canada.

SOIREES.

FOURTH.—On Wednesday, the 2nd February, Mr. Henry M. Ami contributed a note on the "Sequence of Geological Formations about Ottawa," after which Mr. James Fletcher read a very interesting and valuable paper on "Vegetable Parasites." As these papers will appear in future numbers of THE OTTAWA NATURALIST, it is not necessary to give any abstract of them here. They were followed by a lengthy discussion, principally upon the degree of parasitism which might be correctly attributed to monotropa and comandra. Prof. Macoun considered that those present had listened to a paper of unusual interest and clearness of statement, and supported Mr. Fletcher in his views on the parasitism of the above named plants. Dr. Baptie on the other hand was of the opinion that comandra was capable of existing quite independently of any other plant, as it was well supplied with roots, while the attachments to the roots of other plants were few in number. Prof. Macoun said that this plant belonged to the order next to that in which the mistletoe was placed, and in his opinion was at least semi-parasitic. He found it impossible to dry this plant green, and this fact would, as mentioned by the lecturer, point to the absence of true chlorophyll. With reference to monotropa, Dr. Baptie held that it was not parasitic, or that at least there was no evidence of parasitism, and he thought that the intermediary stage suggested by Mr. Fletcher, had as yet no grounds for acceptance. No connection of monotropa with the roots of any plant had yet been recorded, and no person had ever seen the underground root-growth which had been suggested. Mr. Fletcher in reply said it would be almost impossible for any one to observe this stage, on account of the growth being entirely underground, but he trusted attempts would be made to grow the plant from seed, and so definitely settle the question. Mr. R. B. Whyte supported the idea that the plants mentioned were in a greater or less degree parasitic, according as they showed the presence or absence of chlorophyll. A short discussion then followed on the paper which had been read by Mr. Ami, chiefly with reference to the prospects of natural gas being found near Ottawa in quantities available for economic purposes. Mr. J. Stewart, Rev. Prof. Marsan, Prof. Macoun and Mr. Harrington joined in this discussion, as well as Mr. Ami. A fine series of the parasitic plants mentioned in Mr. Fletcher's paper was exhibited by Prof. Macoun.

AFTERNOON LECTURES.

First.—On Monday, 9th January, Prof. Macoun gave the first of a course of Afternoon Lectures arranged—as in former years—for the purpose of introducing the study of the several Branches of Natural History to the members of the Club, and also to any persons desiring to profit by the instruction offered gratuitously by the Club. The subject discussed was Ornithology, and the wider principles of the classification of birds were presented in a clear and interesting manner. Specimens of the skins of well-known species were exhibited in illustration of the structural differences pointed out. The address was followed by an instructive discussion on the food habits of certain species.

Second.—Mr. Ami was to have delivered the lecture on Monday, 16th January, taking as his subject Geology, but as he was unfortunately prevented by sickness from being present, his place was taken by Prof. Macoun, who gave a most agreeable address upon the same subject. He outlined in a graphic manner the supposed formation of the earth, passing from the gaseous, through the liquid condition, until by cooling, the mineral substances were precipitated, and the land, water and air were formed. The appearance first of plant life, and then when the atmosphere had been freed from its carbonic acid gas—the carbon being deposited in the form of coal—of air breathing animals was briefly sketched, and the geological evidences of their development noted. The importance of geology in this connection was thus forcibly shown, and the necessity for its careful study made apparent. In the discussion that followed Mr. Ballantyne expressed himself as fully believing in the theory of evolution of species, as opposed to that of specific creations.

Third.—On Monday, 23rd January, Mr. Henry M. Ami gave a most interesting address on the study of Geology. This science he stated dealt with the origin of our planet, the formation, rise and fall of continents. It was the physical history of our earth, as well as the physical geography. He then briefly considered the advent of life on earth; its progress in time; the characteristic floras and faunas of different epochs; the time when certain types were introduced, and the periods of their abundance and decay. The economic minerals deposi-

ted during the different geological epochs were next discussed, and the origin, mode of occurrence and distribution of some of the commoner ones, such as coal, petroleum, lead, silver, copper, iron, gold and phosphate were touched upon. Mr. Ami showed that the study of Geology was useful, healthful and interesting, and that it was not so difficult as to deter any of his hearers from entering its attractive fields. In investigating the geological features of any locality, a few fundamental principles alone were necessary for the beginner. The leading rocks occurring about Ottawa were then considered, with the different formations exhibited. There were two well defined series of rocks ; those of igneous and those of aqueous origin. The Chelsea hills afforded examples of the former, whilst the Parliament Hill belonged to the second, being of sedimentary origin. The various ways in which such stratified rocks were formed were briefly outlined, and the sequence given of the formations found at Ottawa, with the forms of life which characterize them. In conclusion Mr. Ami referred to the extensive fields open for study at Ottawa, and made an earnest appeal to those present to become workers.

A number of specimens were exhibited, amongst which was one of "mountain cork," a mineral of rare occurrence, which had been sent to him by Mr. Warwick, of Buckingham. Several interesting points were discussed by Messrs. Stewart, Fletcher, Whyte and the lecturer.

Fourth.—On Monday, 30th January, a valuable address was given by Mr. F. R. Latchford on Conchology. Shells, he stated, were portions of certain animals called Molluscs, and were objects in many instances both of utility and beauty, while the softer portions of many species, such as the oyster, mussel, and clam, furnished large supplies of palatable and nutritious food. They might conveniently be divided into two great groups, viz., univalves and bivalves. The latter were represented more largely in America than in any other part of the world. In the basin drained by the Ohio River for instance there were found about three hundred species of Unionidæ, whilst all Europe furnished only seven or eight. While freshwater shells of some families were well represented in Canada, the land shells diminished greatly both in species and individuals as these northern latitudes

were obtained, and one family which only affords one species here has hundreds of species in the Southern States. Our land molluscs could, with a few exceptions, be placed in two groups, the Helicidæ and the Limacidæ, the latter containing the slugs, or species having rudimentary shells. Our species were not climbers, and were to be looked for mostly in damp situations. The larger species could be obtained by turning over logs and stones where the ground was rich and moist, and many of the smaller forms occurred plentifully in the same situations but required to be closely searched for. The small species could also be obtained by collecting moss, grass, leaves, etc., from suitable localities and sifting these materials. Of water shells, such as the Limnæidæ, the greatest abundance would be found in warm shallow bays, while the Unionidæ were to be searched for when the water in rivers and lakes was at the lowest stage. Other forms would best be found in the rapids of streams at low water. Some admirable directions for cleaning and preserving specimens were given, and mention made of certain books for reference, and of the value of exchanging with collectors elsewhere.

Mr. Latchford exhibited a number of beautiful specimens which were greatly admired by all present, and an interesting discussion followed in which Messrs. White, Harrington, Fletcher, Macoun, Small and Ami took part.

Fifth.—On Monday, the 9th February, Dr. H. B. Small was unable to be present to deliver his promised talk on Zoology, but Prof. Macoun very kindly filled the gap and gave an admirable elementary discourse on the vertebrates, omitting the birds, of which he had already spoken on a former day. Of the fishes, which stand at the bottom of this division of animal life, we had still surviving in the Ottawa river representatives of some of the earliest, and lower forms, in the gar-pike, or bill-fish, and the sturgeon. Regarding many of the numerous species of fish found in the varied and extensive waters of this region scarcely anything was known, especially of the smaller forms, and it was most desirable that some member of the Club should take up the study. The influence of habitat upon the size of trout and other fish was well illustrated. Of the Reptiles, mention was first made of the three genera of Anura which occur here, and which

include our toads, frogs and tree frogs; then the salamanders were briefly discussed. Of our snakes and turtles much remained to be learned, and special attention should be given to their study and collection. Passing on to the Mammals, the speaker gave a very interesting comparison of the marsupials, or pouched mammals, now chiefly found in Australasia, with the placental forms which are elsewhere found. The different groups, such as the rodents, ungulates and carnivores were outlined, and finally reference was made to man and the evidences of his existence in bygone days.

In the discussion which followed, further interesting points were brought forward by the several speakers and by Prof. Macoun's reply to them, especially in regard to the failure of the Normal and other public schools to teach Zoology, which was brought forward by Mr. J. Stewart. Mr. Harrington exhibited a fine specimen of *Hesperomys leucopus*, the white-footed mouse, which he had trapped the previous night in his shed. Attention was called to the great beauty of this native field mouse and a few remarks were made on its habits. The President, Mr. R. B. Whyte, urged the collection and study of our small mammals, of which there are many species but little known to the members. Mr. Ami made some remarks on the abundance of the lower forms of animal life and the interest attaching to their study.

ANNOUNCEMENTS.

Soirées.—As the Soirée fixed for the 16th February, had to be postponed because the Concert of the Philharmonic Society took place upon that date, two of the evening meetings still remain to be held, and will be as follows:—March 1st, A Paper by Mr. J. Ballantyne upon "Our Squirrels" and Reports of the Botanical and Entomological Branches; March 15th, A Paper by Mr. A. O. Wheeler entitled "Autumn on the Ottawa," and Reports of the Conchological and Ornithological Branches.

Monday Afternoon Lectures.—February 29th, Mr. R. B. Whyte on Botany; March 5th, Prof. Macoun on Mosses; March 15th, on Classification of Plants.

Annual Meeting.—March 20th, Third Tuesday in month—the Annual Meeting for Election of Officers will be held at 4.15 in the Museum of the Ottawa Literary and Scientific Society. A full attendance of the members is greatly to be desired in the interests of the Club.

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